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The Chemical Age

LXIX 26 SEPTEMBER 1953 No 1785

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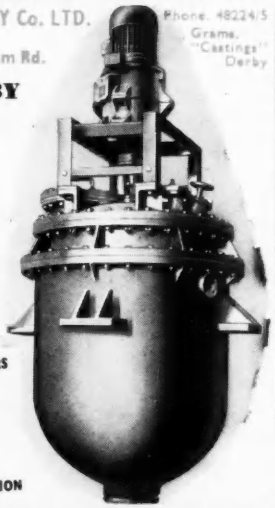

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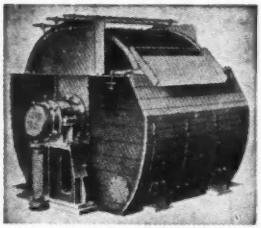

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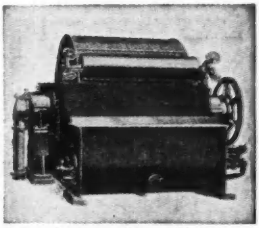

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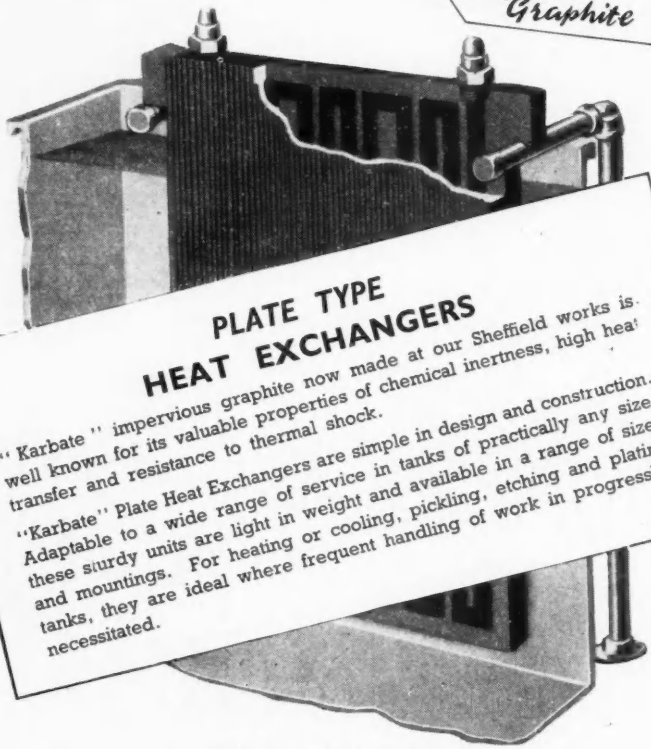

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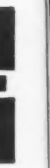

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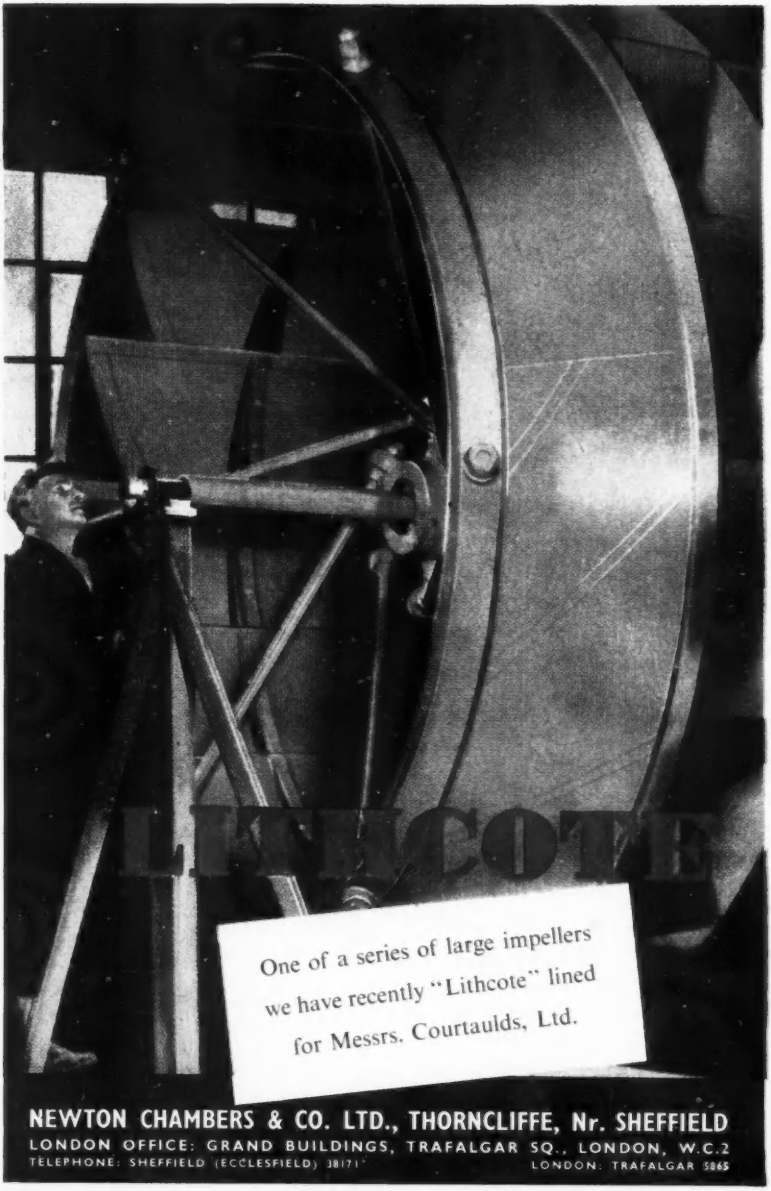
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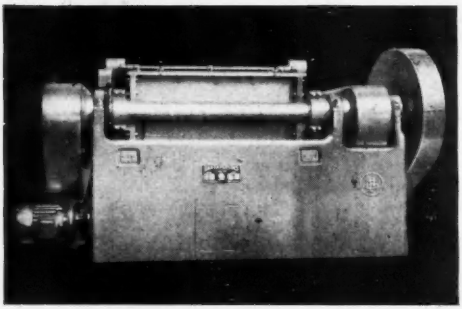

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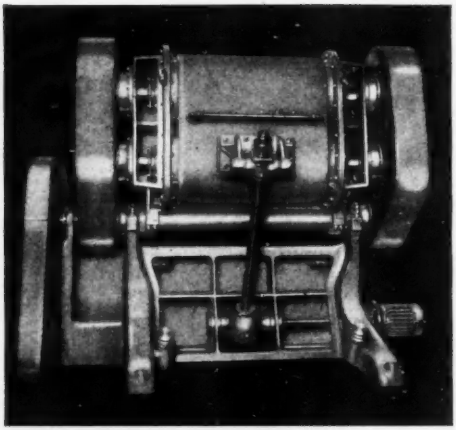

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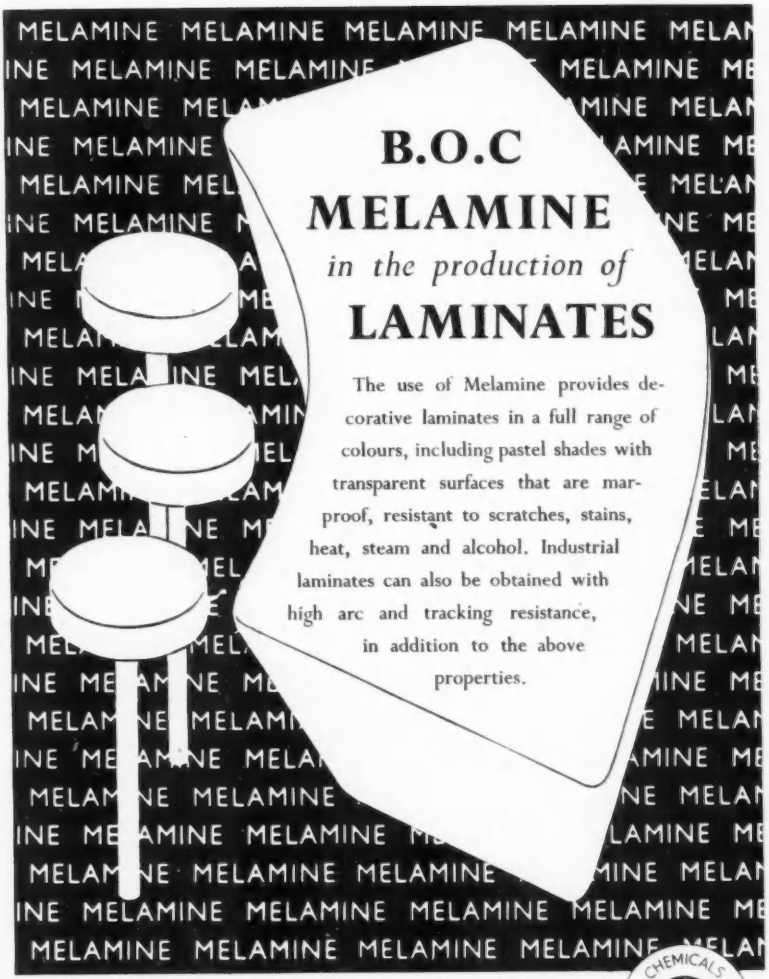
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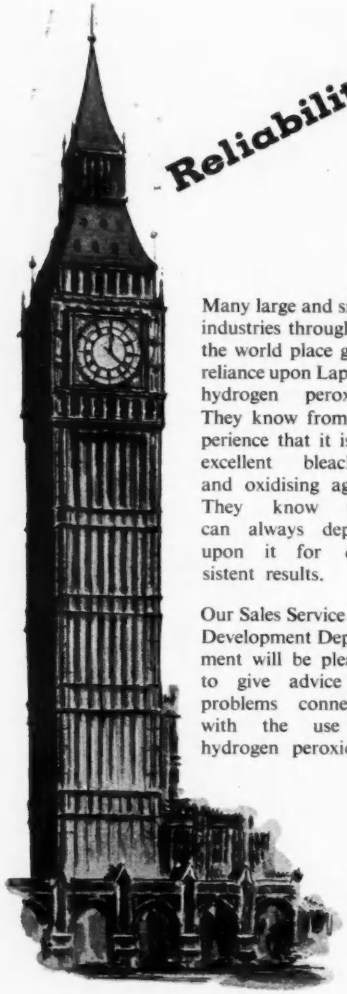

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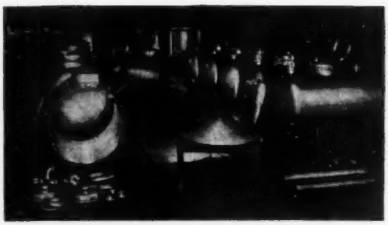

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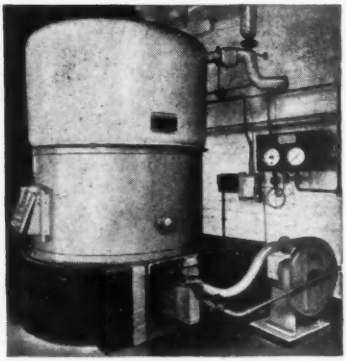

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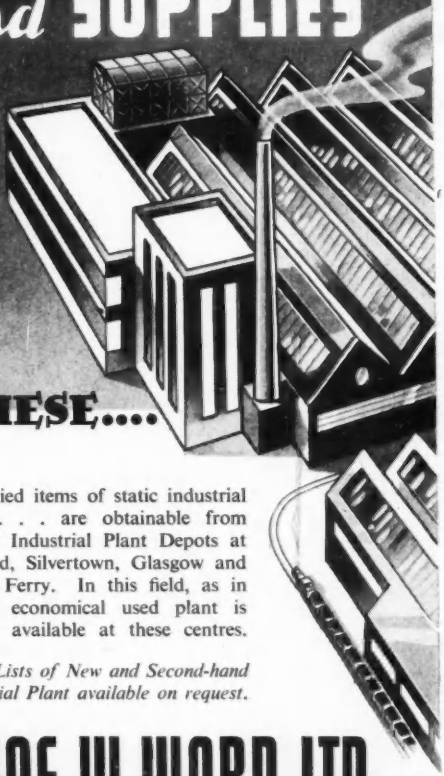

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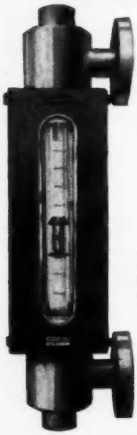

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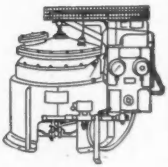

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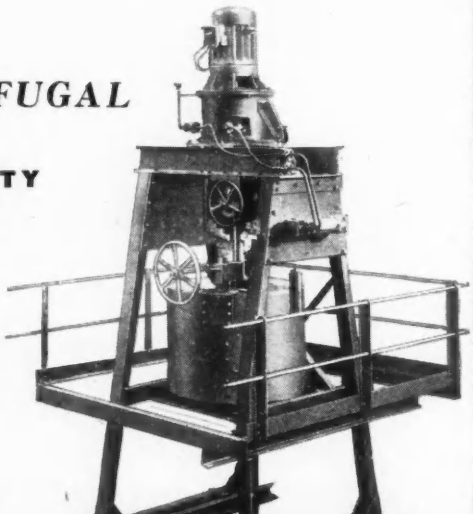

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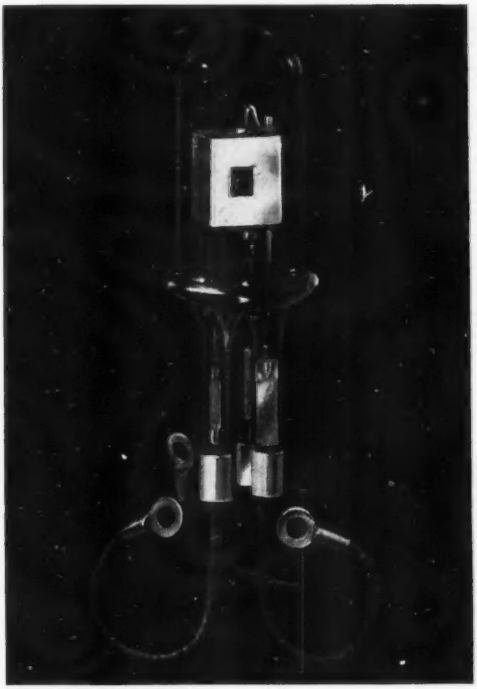

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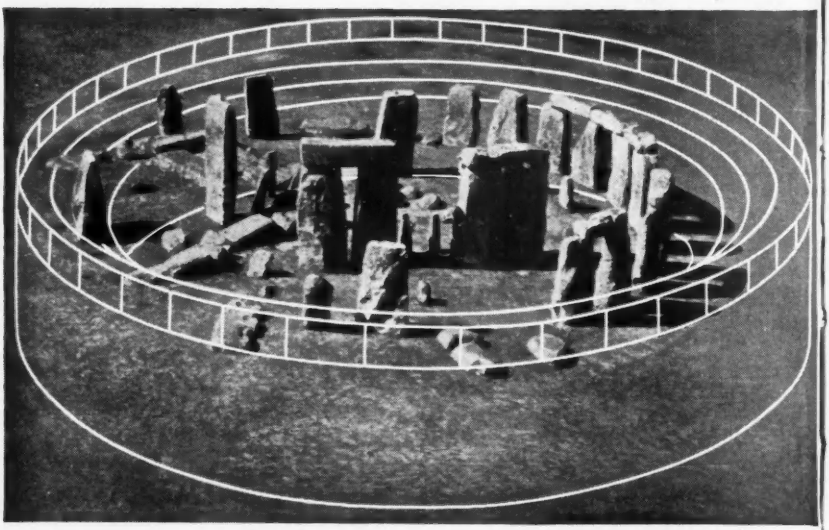

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Phone : Midland 0784/5

SCOTTISH OFFICE 116, Hope Street, Glasgow, C.2.
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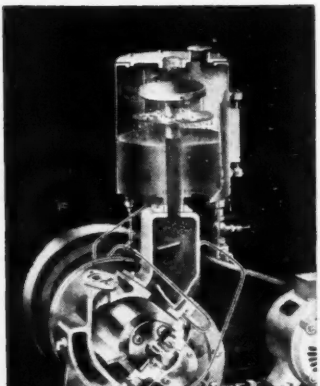

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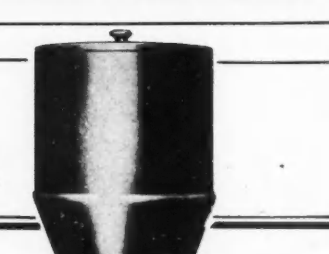

EXTENSIVELY USED FOR THE APPLICATION OF POWDERED REAGENTS FOR WATER TREATMENT PURPOSES AND FOR MEASURING AND PROPORTIONING POWDERED OR GRANULAR SUBSTANCES

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Paper for Printing

IN the past year or two the paper situation has noticeably eased. Daily newspapers have moved a little further away from austerity and most weekly and monthly publications have put on weight. None of this, welcome though it indeed is, means that post-war printed pages are as spacious or numerous as in 1939. Nor, according to a new joint publication by UNESCO and FAO ('Paper for Printing—Today and Tomorrow,' pp. 140, HMSO, 7s. 6d.), is any return to that generous standard at all likely in the forseeable future. 'The basic fact of the situation is that supply, although increasing, cannot keep pace with demand.' That is the world's newsprint problem. And we should not dismiss the problem as unimportant.

Before technological measures are considered, it must be realised that no technical solution can be more than partial. Pulpwood is a naturally renewable asset, but newsprint is also an expression of manufacturing capacity. The rate of investment in newsprint manufacturing plant today is insufficient to produce greatly increased supplies for the future. One reason for this is that manufacturers lack confidence that future pulpwood supplies can regularly sustain a higher rate of newsprint output. The same species of wood that are used have other demands to meet, most of them also expanding and some more profitable. Set against world demand, actual and potential, it seems that newsprint supply must always be short. A world system of allocations according to needs is far too idealistic to be feasible. Canada has less to fear from pulpwood limitations than any other newsprint producing country, but here the dollar problem restricts otherwise great opportunities. Canada's prospects of expanding her newsprint output and exports may be physically good but customers may not have enough dollars to buy more.

The situation of the poorer countries is most unenviable. Inasmuch as national poverty is a consequence of underdevelopment, a considerably greater use of newsprint in such countries is a necessary factor in raising their standards of living. Yet as buyers of newsprint, such countries would seem more likely to receive less and less than the more and more that they quickly need. Fortunately this part of the world paper problem—by far the worst part—can or could be relieved by technological intervention. New paper-manufacturing industries, based upon new materials, could be set up in the under-developed countries themselves. The coniferous softwoods are not the only fibre source that can be converted into paper. Bagasse, bamboo, straw, and tropical forest woods are useable. Of these bagasse, the fibrous residue left after sugar has been extracted from cane stalks, seems the most promising.

Sugar-cane considered as a source of fibre has an initial advantage over tree woods. The first stage required for pulp-making occurs in the crushing needed for sugar extraction. Paper pulp can be obtained from bagasse only by a chemical bleaching and cooking process. This is a disability for newsprint use as chemical pulps are not as effective as

mechanically made pulps; usually, only 10-20 per cent of chemical pulp is added to 90-80 per cent of mechanical pulp; also, the cost of chemical pulp is about twice that of mechanical pulp. For more refined and costly papers, bagasse pulp is an excellent raw material; several mills—in the Phillipines, in South America, in India, and even in the United States—are already successfully making better grade papers from bagasse. But there are recent indications that technology is solving the bagasse newsprint difficulty; a new process, first operated last year, is claimed to make newsprint from 100 per cent bagasse pulp and at about 60 per cent of the present newsprint price. Whether or not this process proves to be the final answer, the development of bagasse pulp and better grade paper industries in sugar-growing countries, most of them in the underdeveloped class, must add to world paper supply. Bagasse pulp itself could be the principal product. Mauritius sugar growers have taken this view and exports of bagasse pulp at only half the price of Scandinavian chemical woodpulp are considered likely. All the big sugar growing countries could do the same.

Bamboo, though uncultivated, grows profusely throughout the tropical belt. It can produce only a chemical pulp, but this happens to be one that can be used for newsprint in rather higher admixture proportions than most other chemical pulps. Mainly, only India has developed bamboo as a source of paper fibres; there some 100,000 tons of pulp a year are used by two of the largest papers mills. There seems small doubt that bamboo could be developed into a major paper-making material if enough effort was devoted to technological investigation.

Straw from cereal crops is not a new source of paper fibres. Straw and rag pulp were mainly used for newsprint until wood pulp was vigorously developed rather less than a century ago. Perhaps the gravest difficulty straw faces is the cumbersome problem of collection and transportation. At present the highest estimate of straw's world use for making pulp is much under 1 per cent of the recoverable tonnage annually grown. However, straw pulp is not attractively cheap to paper manufacturers. Often straw is scarce and as straw pulp cannot be converted into paper without the installation of specially designed mills, there is little long-term incentive for straw to be developed as an important source of paper. Its potentialities in this direction have been exaggerated; or it may be more accurate to say that the straw-into-paper technology has yet to become economically irresistible.

Tropical trees offer relatively small supplies of softwoods. Tropical pine can be effectively pulped and plantations are being grown for this purpose in Australia, New Zealand and South Africa. The main hope for paper pulp from tropical forests or forestry would seem to rest upon hardwood sources and in turn upon papermaking technology. Vast areas of natural hardwoods exist to be used, especially in Africa. The real problem is chemical. Mixed hardwoods from natural forests require more costly mechanical grinding plant, and even this does not overcome the difficulty of the wood species that are harder than others. Pulping by chemical means is also more costly, and it is a firm view in the industry that pulp from mixed species is of poor final quality. It is said that French scientists are overcoming this problem and producing a good sulphate pulp from mixed species in Ivory Coast forests.

Clearly the persistent undertone in all these considerations of alternatives to fir and spruce is technological. The world can use a far wider range of fibrous materials for making newsprint and other papers if a relatively few outstanding technical difficulties are overcome. There seems little reason to suppose that they cannot be overcome in the near future. Recent advances with bagasse pulp would seem to justify general optimism. If the world is to become increasingly literate, its chance of also being self-expressive cannot in any case be limited by the annual output of coniferous wood in North America, Scandinavia and Russia. What technology does not achieve now or in the immediate future, sheer necessity must eventually foster.

Notes & Comments

The 'Applied Report'

THE 1952 'Report on the Progress of Applied Chemistry' is now available, and once again the volume is indeed voluminous. The slight reduction in size that was made in 1951 has not been sustained and as in 1950 the number of pages is back to the top limits of the 900's. There are no slimming measures that can be applied to these annual publications. Scarcely any of the older subjects contracts in importance and new ones constantly demand inclusion. Further changes in classification of subjects have been made. In the organic section, 'Cosmetics and Toilet Preparations' has departed and is replaced by 'Explosives.' As a sign of our times it is to be hoped that the change has no intended social implications. The Inorganic section has added two new ramifications, 'Corrosion of Metals' and 'Road and Building Materials.' In the Food and Agriculture section there is only a slight change 'Enzymes' now becoming 'General Microbiological Processes,' a suitably more comprehensive choice of title. For the first time the number of contributors has reached the 100 mark. This is indeed laudable. For one thing, it reveals that scientists of recognised position (and who must for that reason be busy men) are still prepared to give time and trouble to the not inconsiderable task of recording technical changes; for another, it shows that the ever-growing total burden is being willingly divided among more specialists.

A Valuable Service

ONE policy change should be welcomed by most readers. At any rate it is a cancellation of a change made in 1951. The references at the end of each section are no longer given in alphabetical order; the numerical reference system has been brought back. The text is no longer constantly interrupted because the name of a paper's author or authors must be given, a much more disconcerting interruption than the insertion of digits. Nor is there any cumbersome reference difficulty when one worker's name is mentioned several times. It is right to experiment but few will regret that the new system of the 1951 volume has been quickly discarded. The production of this annual work of reference must be costly. It is to be hoped that the Society of Chemical Industry recoups its expenses by sales to members and non-members. In these days when the economics of society publications have become so much harsher, apprehension that one or another activity may fall by the wayside is logical enough. These Reports must be maintained. In many ways they give a more valuable service than the monthly abstracts.

Voluntary Chemical Education

THE Western Connecticut Section of the American Chemical Society embarked upon a voluntary programme of public education in 1948, working mainly with schools. Their motives were multiple—a sense of public service, desire to enhance general appreciation of the importance of the chemical profession, and awareness of the need to recruit more chemists being perhaps the most dominant. An account of the resultant activities was recently given (*Chemical & Engineering News*, 1953, **31**, 3358) and it merits serious consideration. A vigorous example has been set, and in Britain, where even more than in the United States there are grave shortages of school chemistry teachers, its emulation seems, to say the very least, desirable. We have two if not three professional societies or institutes whose 'chemical' impact upon youth might well be more direct and made at lower age-levels.

Food for Thought

IN 1948 a start was made with an 'Atomic Energy Week' in co-operation with a local 'public affairs group.' This aroused interest and the ACS section appointed an education committee to work with schools in the area. Talks at schools were then given

by various members. In a year or so the 'talking stage' was passed with particularly responsive schools and co-operative work with promising young chemists began. By 1950 an information service, voluntarily supplied by specialist members, had been initiated. Chemical posers that turned up in classrooms could be passed on to this service and every effort was made to provide not merely a terse reply but one that fully covered the subject and stimulated general interest. Exceptionally keen schoolboys were invited to attend one of the section meetings; to guard against the possibility of their being overwhelmed by technical complexity, the principal speaker gave frequent explanations solely for the special visitors. By 1952 competitive examinations with awards of medals were introduced. We might well suppose that this would have been looked upon as a far from popular offering to schoolboys. In fact, in the areas of three ACS sections, 400 students participated. Also in 1952 vocational guidance became a service of the ACS section. Talks, pamphlets on 'The Chemical Profession,' and visits to industrial laboratories were arranged to present chemistry as a career to boys. At the same time there was no attempt 'to lure the student artificially.' In most of the phases of this programme, incidentally, one of the largest US chemical companies co-operated, giving photographs, clerical help, and visit facilities. Here, indeed, there is much food for thought.

Tubular Purity

THE adaptation of tube-ice machinery to chemical manufacture is one of those oddities of development that surprise by being so successful. *p*-Dichlorobenzene and maleic anhydride are being processed in this way in America. Normally, liquid *p*-dichlorobenzene is run into vats, where it cools and solidifies; this being followed by hand-labour removal. With converted ice-tube plant, the liquid is run down the cooled tubes, and some solidifies on the walls while material still remaining liquid is pumped up again for re-circulation. The major impurity in *p*-dichlorobenzene—the ortho- form—freezes at $-17°$, so this continual circulation of liquid material operates as a purifying process. At a desired point the cooling is replaced by thawing and the contact material on the tube walls melts. The solid tube of highly pure *p*-dichlorobenzene slides out and is passed to a cutting or crushing machine. Higher purification and economy in labour are the twin rewards of this ingenious borrowing from the ice industry's range of machinery. A wide variety of plant sizes is available and the operation is wholly amenable to modern automatic control methods. For any organic chemical that emerges from exothermic reactions in the liquid form and whose likely impurities have lower melting points, this method of final processing seems to be a 'natural.'

A party of SCI members recently visited Stanlow Refinery. Seen in the photograph are T. McLachlan (McLachlan & Partners); Dr. E. C. Holdsworth (Yorkshire Tar Distillers); S. Wilkinson (Boots); F. H. Pullom; A. S. Brooman (Shell); C. S. Harper (Min. of Ag.); T. J. Peake (Aluminium Labs.); C. Duckworth (Shell); J. W. Blood (Min. of Ag.); Dr. W. Webster (Distillers); T. G. Heafield (Min. of Ag.); R. J. Clarke; F. J. Bellringer (Distillers); J. L. P. Childs (Shell); and Dr. C. D. Muir (BDH)

Coke & Coal Chemicals in 1952

US Bureau of Mines Report

PRODUCTION of oven and beehive coke in the United States in 1952, as reported to the Bureau of Mines, US Department of the Interior, decreased 14 per cent from the record established in 1951 and totalled 68,254,109 net tons. As coke production is geared closely to steel production, the lengthy strike in the iron and steel industry caused virtually all of the 'furnace' oven- and beehive-coke plants to suspend operations during June and July.

However, although production of coke dropped drastically in 1952, the banking of iron blast furnaces during the steel strike reduced coke requirements proportionately and supplies of metallurgical coke were sufficient in general to meet essential needs. According to data supplied by all producing companies on the disposal of coke in 1952, 86 per cent was utilised by iron blast furnaces, 4 per cent by iron foundries, 4 per cent for manufacturing producer gas and water gas, 3 per cent for other miscellaneous industrial uses (non-ferrous smelting, chemical processing, etc.), and 3 per cent for residential heating.

Effect of Steel Strike

The silica brick supply improved during the year with the installation of additional brick-making facilities, but the steel strike curtailed the flow of essential steel and delayed until 1953 a large part of the new capacity that was expected in 1952. In spite of these difficulties, the coke industry experienced one of the greatest construction years in history. Coke producers reported that 947 new ovens with an annual coke capacity of 5,317,400 net tons were completed and 1,075 new ovens with a designed annual coke capacity of 5,983,600 net tons were under construction on 31 December, 1952. All of the ovens completed in 1952 did not represent additional capacity as a large number were replacement of old ovens previously dismantled. Although 658 ovens having an annual coke capacity of 2,945,000 net tons were taken out of production either for rebuilding or permanent retirement, the industry did achieve a net gain of 289 ovens during the year.

Production of the primary coal-chemical materials and derivatives was adversely affected by the interruption in oven operations in 1952. Output of each of the following dropped 12 per cent below the 1951 totals—crude tar, crude light oil, and coke-oven gas—and ammonia production (NH_3 content of sulphate and liquor) fell 11 per cent.

Substantial Decreases

The reduction in supplies of crude tar and light oil naturally resulted in substantial decreases in production of the various derivatives. Production of benzol (excluding motor grade) at oven-coke plants decreased 10 per cent in 1952, toluol and xylol, 11 per cent; crude naphthalene, 19 per cent; creosote oil, 8 per cent; and crude chemical oil, 18 per cent from the 1951 figures. Although supplies of benzol, toluol, and naphthalene were scarce at the beginning of the year, supplies were in closer balance with demand at the end of the year than they had been since early 1950. This was not true of the refined grade of pyridine, however, which started the year in short supply and ended the same way.

Prices on coke and coal chemicals were under Government control in 1952 and only minor changes occurred. The Office of Price Stabilisation issued amendment 13 to SR 13 on 21 November, 1952, which allowed an increase of 3.75 per cent in the ceiling prices of coke and coal-chemical products. This order permitted producers to spread the 3.75 per cent increase among their various products, subject to a maximum limit of 10 per cent increase on any one ceiling price.

The order also contained a provision requiring that the gross amount of relief granted be apportioned by each producer between coke and coal chemicals in the same proportion in which these products provided sales revenue in the twelve-month period ending 30 April, 1952. Although some of the producing companies increased prices on some of their products following publication of this order, there was not a general price advance on an industry-wide basis and averages for the year were not affected.

Fuel Conservation

Productivity Council Report

IT is within our capacity as a nation to save, on the present level of industrial activity, no less than 30,000,000 tons of coal per annum without impairing any services. This is the conclusion of a British specialist team on conservation of fuel, heat and energy, in its report to the British Productivity Council. The team, composed of 12 fuel utilisation experts drawn from the engineering, heating and ventilating, brewing, chemical, textile and paper industries, last year made a specific study of power installations and manufacturing and process plants in the USA, and their report has recently been published.

Throughout the report, the indictment of fuel waste in this country is expressed in the strongest terms: 'it is a sad commentary upon our national intelligence that from all the hard-won coal we consume, some 80 per cent of the heat is lost, a great deal of it because of ineffective utilisation.'

Lines of Attack

The team emphatically commends to the attention of British industry at large two significant lines of attack adopted in the American drive for fuel economy. The starting point of one was consideration of the relative costs of mechanical power and man-power. 'The American industrialist takes full advantage of mechanised power and is prepared to give his workers the maximum use of it because he realises that it is infinitely cheaper than human effort. He has accepted and put into practice the principle that it is much more important to keep the machine, not the man, working hard. This is claimed to account largely for the high rate of productivity in American industry.' The other was the inception of the dual-purpose generating station. 'One possible method of improving efficiency in the public generation of electricity is by the adoption of dual-purpose stations producing and selling both heat and power. Such stations would be equipped with back-pressure or pass-out turbo-generators supplying exhaust or bled steam to nearby industrial, commercial or domestic premises.'

In comparing sources of energy other than coal in Britain and America the team emphasises that the alternatives in Britain are very limited: 'to all intents and purposes no natural gas is available in the UK' and 'the greater part of the natural water-power resources which could be economically harnessed has already been exploited or is planned for development. Other sources of energy considered are underground gasification of coal, wind-power, methane from coalmines, and nuclear fission'.

The report concludes: 'With the country looking for an authoritative line of action, we suggest one bold stroke to set us on the right road; enact legislation to create a permanent and non-political Fuel and Power Board. Let that board formulate whatever policy is necessary, but above all let it get on *first* with co-ordination.' Already it has been decided to set up a new Fuel Efficiency Organisation, for the initiation of which the British Productivity Council has accepted responsibility. The detailed findings of the team cannot fail to be of value in the formulation of its policy.

'Fuel Conservation,' HMSO, pp. 102, 5s.

New-Type Catalytic Reformer

THE Pure Oil Company, Chicago, has contracted with The M. W. Kellogg Company, Jersey City, N.J., for the design and erection of a catalytic reformer at its Heath (Ohio) refinery. The plant will employ the recently disclosed Sinclair-Baker platinum catalyst for which the Kellogg Company is sales agent. The company is also the authorised designer of the new process.

The new catalyst is a material which is claimed to have three major advantages for petroleum refiners. Because it is a regenerative type, it maintains its high activity over extremely long periods of time, resulting in low catalyst costs; it also has excellent ability to convert low octane paraffinic components to high octane aromatics; further, it may be employed on a wide variety of feed stocks.

The new plant at Heath will process 3,000 barrals of naphtha daily and convert a low octane (about 33) feed to high octane gasoline which will rate about 98 octane with 3 cc. TEL. Provision will be made in the design of the plant for its operation on high sulphur naphthas, should crude market conditions dictate the use of such feeds.

Match Industry in the UK

Corporation Chairman Comments on Commission's Report

IN the year which has elapsed since the last evidence was given to the Monopolies and Restrictive Practices Commission on the Supply and Export of Matches and the Supply of Match-making Machinery, changed conditions have rendered out-of-date much of the contents of the Commission's Report (a summary of which appeared in THE CHEMICAL AGE on 23 May last, pp. 785-786).

The Hon. Hugh K. M. Kindersley, chairman of the British Match Corporation Limited, made this claim when speaking at the annual meeting of the Corporation in London last week.

Among his subsequent comments on this matter were the following:—

On 18 June, 1953, the President of the Board of Trade stated in the House of Commons that he proposed to explore the possibility of removing some of the obstacles to competition in the match industry. He added that some of the steps he was contemplating called for consultation with the British Match Corporation. These consultations are proceeding and, therefore, it would not at this stage be right for me to discuss them, or any alternative action which might be taken by the President or by ourselves.

Misleading Impression

We remain free, however, to express our opinion on the body of the Report and to attempt to correct the misleading impression created by its presentation. On 19 June, 1953, we sent a letter and memorandum to the Board of Trade giving them our views on the Report and expressing our opinion that the Corporation have been unfairly criticised both in the Report and, in consequence, by the Press.

On 25 June, 1953, we invited the Press to a conference at which we placed before them certain facts, which showed the match industry in a different light. As a result of this conference most of the responsible newspapers published articles drawing attention to those major elements in the situation which had been ignored or given insufficient emphasis in the Report of the Monopolies Commission. The truth cannot be too widely known and I therefore make no apology for returning now to this subject.

The Report drew attention to the fact that about 30 per cent of the ordinary stock of the Corporation is held by The Swedish Match Company. This has, of course, been public knowledge ever since the Corporation was formed in 1927. The Swedish Match Company does not control the Corporation nor has it ever attempted to do so.

The remaining 70 per cent of the ordinary stock is widely held and of the 9,544 ordinary stockholders to whom the final dividend will be paid there are 8,290 whose holdings do not exceed £500 stock.

High Profits Alleged

The Report has alleged that our profits have at times been high. We have emphasised to the Board of Trade that the rates of profit in the match industry in this country since the war are not high compared with those earned by industry in general and we do not accept as valid the grounds on which that allegation was made. We maintain that in order to remain healthy an industry must be able to earn fair profits. The Commission, by using historical costs as a yardstick and rejecting a fair assessment of working capital, have over-stated the rate of profit earned by the match industry.

Some important features of the match trade are not fully appreciated by the general public:—

(1) In 1939 a box of matches cost 1d. Since then the duty has been trebled but the price has only doubled.

(2) The Exchequer takes more than 1d. in duty out of every 2d. the public pay for a box of matches. The duty referred to brings to the Exchequer £12,000,000 per annum—40 times as much as the taxed profits of the principal match manufacturers and importers.

(3) Unless the duty on matches is reduced, there is little or no prospect of the general public being able to buy matches more cheaply than they can now. In fact, the President of the Board of Trade said in Parliament on 18 June, 1953: 'The Commision's Report makes it clear that any measures which may be taken can, in the nature of things, have only a slight effect.

either on the economy or on the individual.'

(4) The Report says there is little or no competition. Last year 1,064,697 gross boxes of competitive matches were imported into this country, partly from behind the Iron Curtain, where politics and the need for foreign exchange count for more than normal commercial profits. Although the Corporation is quite prepared to meet fair competition, the fact remains that the potential dumping is enormous. In accordance with our undertaking to the Board of Trade we maintain our own average contents at 47 matches, but boxes are now being imported by our competitors containing 43 matches, saving the importers about 1s. 2d. per gross in duty because of the reduced contents. For these matches the public are induced to pay 2d. per box.

There have been two competitors manufacturing in this country for 20 years and they had no complaints to make to the Commission of the way in which the Corporation had treated them. The Corporation has supplied timber to these competitors without profit, and continues to do so.

(5) The Report alleges that our costs have 'at certain times' been high, but it shows that the costs of our competitors in this country have been higher than ours, and so have those of our overseas companies. There is no other comparison available.

(6) There is nothing whatever to prevent competitors, at home or abroad, from making matches and selling them in this country. If our costs, prices and profits had been too high others would have come into the market.

Ignorance of these facts has caused the industry to be judged unfairly by the public.

A Competitive Success

The British Match Corporation has achieved its position by being a competitive success and not by restrictive practices. We are proud of our record:

(a) We have built up an industry threatened with extinction by dumping so that, when the war came, there were matches to be had.

(b) We have expanded our British sales from 8,500,000 gross boxes in 1927 to 13,000,000 in 1952 and this on a static total market.

(c) We have, by manufacture and import, provided a wide range of matches second to none in quality.

(d) We have never created an artificial scarcity.

(e) We leave the trade free to buy where it likes and sell at what price it likes and have no black lists.

(f) We have built up interests in the Commonwealth and abroad, where our trade is twice as large as at home, and from which this country has received, since the war, overseas currency averaging about £300,000 per annum.

(g) We employ over 3,000 persons at good wages, in good conditions and without industrial strife.

New USA Products

FULL-SCALE production of ethylenediamine tetra-acetic acid (EDTA) and its salts has just been announced by Glyco Products Company, Inc., 28 Court Street, Brooklyn 2, NY. This series of products has proved to be one of the foremost developments of recent years in the sequestration of trace metal impurities in industries where such impurities have been most troublesome. Under the trade-mark 'Tetrine,' Glyco is producing tonnage quantities in its plant at Williamsport, Pa. Modern equipment ensures the production of high purity material.

Textile processing and dyeing, soap and synthetic detergents, metal cleaning and plating, agriculture, cosmetics, leather, germicides and many other important industries are consuming rapidly-increasing quantities of EDTA and its salts. When used in the dyeing of textiles, for example, the presence of a small percentage of a Tetrine produces brighter, cleaner, uniform shades with an actual overall economy; in liquid soaps and shampoos, as well as in synthetic detergent formulations, clarity and brightness are obtained, as the formation of unsightly and undesirable impurities is prevented.

The Tetrines are claimed to be exceptionally stable and to function efficiently in highly acid, neutral, and strongly alkaline solutions. They function by complexing or sequestering the trace metal impurity so that it is rendered harmless under processing conditions.

Literature and samples of these new products are available from the address given above.

Recent Advances in Distillation—Part I*

by G. A. DUMMETT, M.A., A.M.I.Chem.E., &
P. V. CLIFTON, M.A., D.Phil., A.R.I.C.†

AN outline of the advances which have been made in the technique of fractional distillation since 1940. Under the principles of distillation, the importance of accurate vapour liquid equilibrium and vapour pressure data is stressed and modern proposals for the solution of multicomponent distillation problems are examined. The improvements in distillation plant are limited to an examination of recent plate and packing types, with particular reference to column capacity, plate spacing and flexibility. In the second part, to be published next week, some examples of extractive distillation processes are examined, which includes the use of phenol, acetone, methanol and water as separating agents. Attention is drawn to the importance of heat exchange in efficient distillation plant, and to modern low temperature gas fractionation where heat exchange is of particular importance.

THE last war was responsible for an enormous stimulation of the chemical industry in general and many of the advances in industrial technology made since 1939 may be directly attributed to it. Thus, the development of the catalytic cracker, as we know it today, was accelerated to satisfy a war-time need and it is doubtful whether atomic energy development would have been so rapid without the stimulus of the war. Distillation also received its share of attention during this period and considerable progress has been made. The field is a wide one and, though few advances have been spectacular, there have been many substantial developments. It is clearly impossible to review them all in one short paper which, therefore, is confined to those topics which seem to be specially worthy of comment here.

PRINCIPLES OF DISTILLATION

Most important among the industries which could not exist without distillation plant are those concerned with petroleum, coal tar and solvents. Although, in the past, it has been rather the last two which have required fine fractionation, the recent considerable extensions of oil refining capacity in this country have emphasised the need already felt in the smaller industries for more precise techniques for the design of economic fractionating units.

Whatever technique for column design is adopted, the importance of working from accurate vapour-liquid equilibrium data cannot be over-emphasised. The task of determining such data accurately in many cases presents problems requiring considerable analytical ingenuity and painstaking care in the operation of the equilibrium still itself. True equilibrium between liquid and vapour is not easy to establish and the magniture of the difficulties can be better appreciated from Fowler's[1] recent account of the development of the equilibrium still itself. Contemporary techniques are illustrated particularly well in the published work of Ellis,[2] Garner,[3] Norman[4] and Norman and Hands.[5]

Modern experimental data is customarily correlated by a thermo-dynamic consistency check using the activity coefficient in accordance with the principle so well set out by Carlson and Colburn.[6] It is unfortunate that, to date, no solutions of the Gibbs-Duhem equation have been discovered for systems of more than two components of simplicity comparable to those of Van Laar, Margules or Scatchard and Hamer for binary mixtures. Norman's analysis[4] of vapour-liquid equilibrium in systems such as ethyl alcohol-benzene-water is a classic example of the use of the activity coefficient in correlating complex ternary equilibria. Wide gaps in our knowledge of vapour-liquid equilibria remain, however, particularly for the lesser known binary systems, and for practically all multi-component systems.

Fortunately, many of the problems which present themselves to the designer of distillation equipment are concerned with the separation of chemically similar substances, generally members of one homologous series, in which there are only small departures from ideality and where it is possible to proceed quite satisfactorily from a knowledge of the vapour pressures of the pure

* Read at the Chemical Engineering Conference, Olympia, London, on 10 September, 1953.

† The A.P.V. Company, Ltd.

components alone. It is noteworthy that the Chemical Research Laboratory at Teddington is engaged in the determination of really accurate vapour pressure data[7] and that a great deal of information on the vapour pressures of pure substances has been collected in a most useful form.[8]

It should be emphasised, however, that it is desirable to check designs which assume ideal behaviour in some form of pilot plant. Careful correlations between industrial sizes of fractionating plates and small laboratory packed columns have been made by some companies, however, and found to be of the greatest value, reducing pilot plant work to a minimum.

Very many papers dealing with the calculation of distilling columns have appeared in the literature over the past ten years and, since Fenske's early paper on the fractionation of Pennsylvania gasoline[9] in which simple equations for the minimum number of plates and minimum reflux ratio for a given separation were developed, the subject has been extended greatly and has become a good deal more involved, mathematically. That such elaboration may be neither desirable nor advantageous is shown by recent papers of Underwood[10,11,12,13] which contain much valuable material on the calculation of multi-component systems, including an improved expression for the minimum reflux ratio. The methods he has evolved achieve simplicity without sacrifice of accuracy.

Between the extremes of total reflux and minimum reflux ratio lies the most economic reflux ratio and the corresponding optimum number of plates. The rapid correlation of reflux ratio and number of plates, given the minimum reflux ratio and minimum number of plates is, therefore, most useful. For this, Donnell and Cooper[14] give an alternative nomogram to that of Gilliland.[15] The latter has also been critically examined by Forsythe and Franklin[16] who point out its theoretical limitations. The method, when used as a prelude to more accurate step-by-step calculation is, however, of great practical value.

Fractionation Plant

Discussion here will be limited to improvements in the fractionating tower itself and, more particularly, to the plates or packing on which mass transfer takes place. In considering the type of fractionating column for a given duty, one of the first factors which influences the choice of a particular plate or packing type is the absolute pressure at which the proposed separation is to take place, and this in its turn is generally dictated by the maximum re-boiling temperature permissible at the column base. This temperature may be decided by the necessity to avoid thermal cracking or polymerisation of the process material, or by the maximum temperature of the available heating medium.

Packed Columns

As the pressure drop across a plate column is generally much larger than that across a packed column of equivalent efficiency, separations which for one reason or another must be made in the range 1 to 50 mm. Hg abs., are often made in packed columns in which not only is the overall pressure drop small, but also variations in liquid and vapour rates through the column, due to the effect of pressure variation, are consequently generally not large. Considerable differences in loading through a tall packed column may arise, however, if insufficient attention is paid to thermal insulation, particularly when distilling high boiling compounds. For small scale work, as with pilot plant or laboratory columns where the heat loss effect is of even greater relative significance, it has been shown[17,18] that reproducible results can only be obtained with a given column if it is operated adiabatically.

A further insurance against erratic behaviour in packed columns is the provision of efficient and frequent reflux distribution. This ensures a uniform flow of reflux throughout the column and minimises the channelling effect. The channelling problem is accentuated as the column diameter increases and it is uncommon, in this country, to design random packed columns of greater diameter than 3 ft., although the Gesellschaft für Teerverwertung at Duisberg-Meiderich,[19] during the war, operated packed columns of 2 to 2.5 metres diameter for the vacuum distillation of tar products. It is doubtful, however, if these were very efficient.

In packed columns of large diameter, it is often tempting to consider using the smaller sizes of packing in order to achieve, in a given column height, a greater number of transfer units or, in other words, better products for a given heat input. When this is done and when, therefore, the ratio of column diameter to packing diameter is very

large, channelling is frequently induced and flooding velocities so reduced that no advantage is attained over a larger and cheaper size of packing.

The calculation of packed columns has, in the past, been generally regarded as more difficult than that of plate columns, for which the simplifying concept of constant plate efficiency over a range of vapour loads has been applied. It now appears that packed column performance may be predicted simply with considerable accuracy[20,36] and this must be regarded as a real step forward.

Current requirements of an industrial column packing would appear to be low HTU, high capacity, not too great a sensitivity of HTU to reflux and vapour rates, low pressure drop, good anti-fouling characteristics, robustness and cheapness. Within the authors' experience, the Berl saddle has better overall characteristics than most other ceramic packings but is rather more expensive and less robust.

Grid packings are especially useful where very low pressure drops are needed. Their operation has been examined and an interesting carbon grid packing described by Norman.[21]

Another group of column packings with which very much greater column efficiencies are obtainable includes the various metallic gauze packings, and these are entirely a product of recent times. Sterman,[22] Podbielniak[23] and Dixon[24] gauze packings are very much more expense than the solid ceramic types and, for this reason alone, if for no other, they are generally used only in the pilot plant or research laboratory. With them, highest efficiencies are obtained at speeds only slightly greater than that required to maintain the gauze apertures sealed and, consequently, the capacity of gauze packed columns is low.

Nevertheless, hold-up per transfer unit is also low and very sharp cuts between fractions may easily be made. There is considerable doubt whether such packings can be effectively used in columns of diameter greater than a few inches, quite apart from economic objections.

Bubble Cap Columns

Bubble cap and, to a lesser extent, perforated plates are probably the best known fractionating devices, well established and thoroughly predictable in performance. They have, however, certain limitations and it is from attempts to improve the efficiency, pressure drop, capacity and flexibility of the conventional types that advances in plate design have been made.

A plate which is hydrodynamically sound is likely also to be sound as a fractionating device and the practice of investigating plate hydrodynamics with the air-water system in glass or Perspex models is, therefore, spreading. For example, an improvement in plate efficiency is only likely to result from a thorough understanding of the mechanism of vapour-liquid interaction and, to this end, the formation of bubbles at cap slots is being closely studied in such models at Birmingham and in industry generally.[25] Working models are of the greatest use in the early stages of the development of a plate, but it should not be assumed that such characteristics as pressure drop and maximum throughput obtained in such apparatus for the air-water system can be accepted as typical of the performance of similar plates in an actual distilling column.

Bakowski[26] has applied the results of his studies of bubble formation to the calculation of plate efficiencies on bubble cap plates—an interesting and significant development.

Column Capacity

There is no doubt that, during the period under review, a great deal of progress has been made in the understanding of those variables which control the throughput of distilling columns and this has resulted, naturally, in new plate designs which are able to accommodate, within a given diameter, very much larger quantities of vapour. Eduljee[27] recognised the interdependence of plate efficiency, entrainment and limiting throughput and concluded that the performance of fractionating plates was controlled by a vapour energy expression, for example, ρv^2 or $v\sqrt{\rho}$ (where ρ = vapour density and v = vapour velocity) which is a constant for a given column and with which reliable predictions of the limiting velocity for a variety of vapours under all pressure conditions could be made.

Thus, the optimum design load or capacity of a given column is now generally expressed in the form $v = \sqrt{K/\rho}$, where v may refer to the vapour velocity through the column shell or through some controlling active portion of the exchange area.

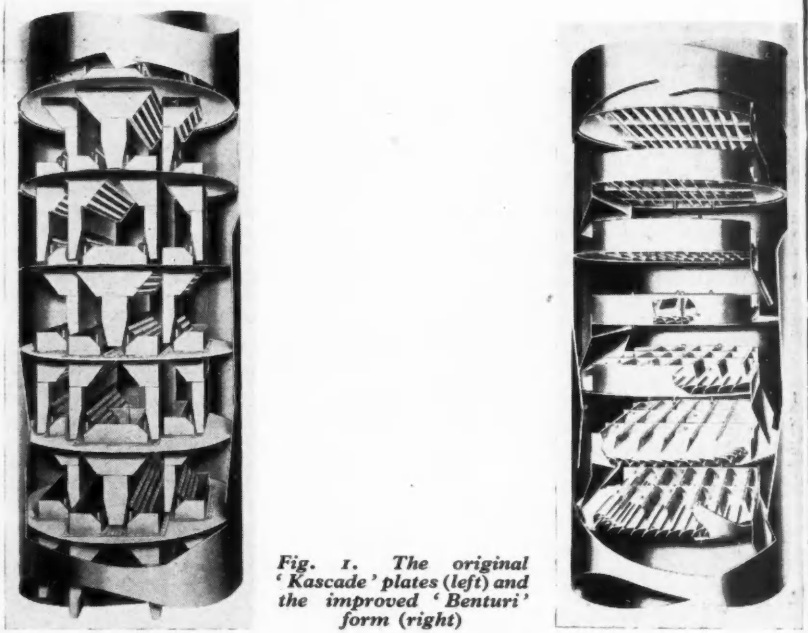

Fig. 1. The original 'Kascade' plates (left) and the improved 'Benturi' form (right)

The effect of bubble cap diameter on capacity and an enlightened discussion of the problem of column capacity generally have appeared in two recent publications from Kirschbaum.[28,29]

One of the first high capacity plate designs to be developed since the war was the Koch Kaskade plate (Fig. 1), which has recently been improved and marketed as the Bent Venturi or Benturi plate.[30] Garner, Ellis and Hugill[31] have examined the distilling characteristics of a Kaskade column and find that, for the same plate efficiency and pressure drop, the Kaskade plate works at an overall vapour velocity of 2 to 3 ft. per sec. as compared with 1 ft. per sec. for a bubble cap tray. Further, at a plate spacing of 16 in., the plate efficiency increases steadily up to a velocity of 4 ft. per sec. whereas the bubble cap plate efficiency generally declines at vapour velocities greater than 1 ft. per sec.

From the data which are available, the Kaskade plate appears to offer considerable technical advantages although it is probable that neither the installation of the plates nor their fabrication are as straightforward as some alternative designs. Moreover, its performance is markedly dependent on the liquid mixture distilled.[31]

Perhaps the most outstanding advance in increasing the capacity of distilling columns has been made by the Shell Development Company in their new Turbogrid tray[32,33] (Fig. 2). This would appear to be able to accommodate very much greater vapour loads than the bubble cap at high plate efficiencies and low pressure drop. As the plates are devoid of downcomers and reversal annuli, they have extremely good antifouling characteristics and, due to their extreme simplicity and ease of fabrication, Turbogrids cannot very well be expensive. For distillation plant which operates continuously at fixed load, therefore, the Turbogrid has much to recommend it and it is, indeed, finding increasing favour, particularly in the petroleum field where throughputs are generally very big indeed and duties are steady.

One would not expect a Turbogrid to maintain such excellent characteristics over

Fig. 2. A photograph showing some of the structural features of a 'Turbogrid' tray

(By courtesy of the Hendrick Manufacturing Co.)

more than a limited throughput range, nor to apply one designed for atmospheric duty to vacuum work or to other duties with very dissimilar vapour or liquid loadings. Published figures show that the plate efficiency varies very substantially with vapour velocity.[33] Moreover, the plate is unsealed and must show some at least, of the instability of the conventional perforated plate.

Plate Spacing

The ability of any plate to accommodate large quantities of vapour per unit column area is of direct interest to the potential purchaser of distillation equipment since, for a given throughput and reflux ratio, the high capacity column will be of smaller diameter and, other things being equal, will be cheaper. Of equal, or perhaps of greater, importance is the spacing between plates which not only has a direct effect on the column height, but also influences the lengths of instrument lines, pipe work and, last but by no means least, the amount of structural steel work and foundations necessary to support the unit. It will be appreciated that the support for a column containing 100 plates at 2 ft. pitch would present an entirely different engineering problem to that for one containing 100 plates at 6 in. pitch. For instance, a saving in civil engineering costs alone of £80,000 out of total capital cost of £500,000 has been made recently by installing plates at 8 in. pitch instead of 2 ft.

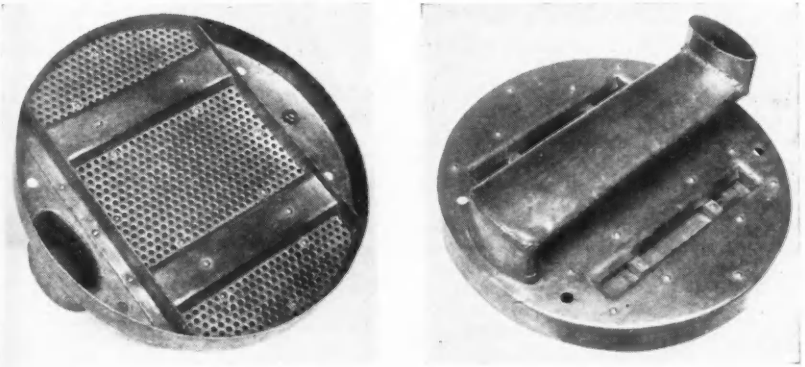

Fig. 3. West plate

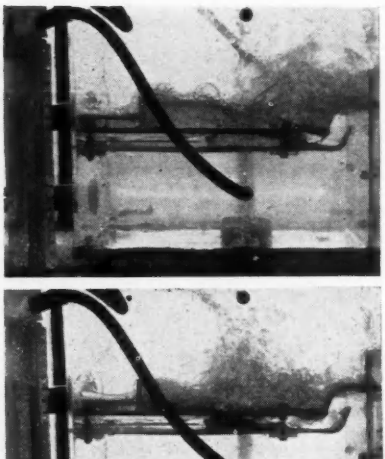

Fig. 4. West plate showing three stages in 'opening up'

Of the very few plates which are customarily installed at low pitch, the recently developed West plate (Fig. 3) is a decided advance on most contemporary types. It may be regarded as a combination of the perforated plate and the sealed bubble-hood plate. It, therefore, shares the advantages of both types and thus combines the stability of a bubble-hood plate with the high limiting vapour velocity of a perforated plate.

The West plate is remarkable for its flexibility. A simple perforated plate will normally operate satisfactorily over only quite a small range of vapour rates but the West plate is not so limited and its operation, with a gradually increasing vapour rate and constant liquid rate, may be appreciated from the sequence of illustrations (Fig. 4). At low vapour rates, only those holes adjacent to the hood lip pass vapour and the plate behaves perfectly satisfactorily under these conditions. As the vapour load increases, the cushion of liquid under the perforated plate is pushed back and more perforations become active, until the vapour streams from adjacent half hoods meet.

Further increases in load from this point are largely dependent on the size and pitch of the perforations, but as this latter factor also effects such properties as efficiency and pressure drop, a standard perforated sheet with good efficiency and pressure drop characteristics has been adopted. Owing to the variation in area utilised with vapour velocity, the velocity through the perforations themselves and, consequently, the plate efficiency, remains constant, virtually independent of loading over at least a four-fold range. For batch plant, or continuous plant working with a variable crude, this is of great advantage.

The limiting velocities attained at low plate spacings are about the same as those obtained with bubble cap plates at three times the plate spacing but with substantially higher plate efficiency. Some of this is due to the provision of co-ordinated reflux—that is to say, with the direction of reflux flow arranged to be the same on successive plates. With such an arrangement it can be shown that the concentration gradient across each plate is at a maximum and, therefore, that the plate efficiency is as high as possible. Kirschbaum[29,34,58] was the first to show that the difference between this and the normal arrangement could be substantial. The effect is dependent, however, firstly on having a large number of successive contacts between liquid and vapour as on a perforated plate and, secondly, on avoiding mixing in the vapour phase.

(To be concluded)

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Research Fellowships

UK Candidates Benefit by USA Scheme

IN response to a request from the Organisation for European Economic Co-operation, the United States Government, through its Foreign Operations Administration, has provided funds of more than $1,000,000 to enable 150 outstanding young scientists from Europe to travel to and live in the USA for up to two years in order to study and gain experience in American research institutions.

By this means it is hoped to advance scientific research and to facilitate the adoption of the results of scientific research in production techniques. The funds are available in the first instance until the end of 1955. The National Academy of Sciences, Washington, is administering the scheme and the Royal Society has accepted the invitation of the Academy to advise on the selection of candidates from the UK.

Successful candidates, who will be required to undertake to return to resume scientific work in their own countries on completion of tenure of fellowships, will be placed in American universities to participate with American colleagues in current fundamental scentific research as closely as possible related to their own fields of interest. Most of their time will be spent working in this way, but opportunities may also be provided towards the end of the tenure of the fellowship for work on problems in industrial or other laboratories in applied research related to the fundamental research they have previously carried out.

No Age Limits Specified

About 25 fellowships will be open for award to candidates from the UK. No age limits are specified, but it is expected that most of the successful candidates will be between 26 and 32 years of age. Applications will be considered from candidates who propose to do research in the natural sciences and in the engineering, agricultural and medical sciences, but excluding clinical medicine. They must be in possession of a doctoral degree in science recognised in institutions of higher education or have equivalent experience.

Applications, which may be made at any time, will be considered at regular intervals. For the first two sets of applications the closing dates are respectively 1 October and 30 November, 1953. Forms of application and further detailed information are obtainable from the Asssistant Secretary, The Royal Society, Burlington House, London, W.1.

Superphosphate Discussions

NEARLY 200 delegates from 21 countries assembled in Cambridge last week for a series of technical meetings organised by the International Superphosphate Manufacturers' Association. Twenty-six papers on technical aspects of superphosphate production and usage were presented. The meetings, for which the hosts were the Superphosphate Manufacturers' Association (Great Britain) were held from 14 to 18 September under the chairmanship of M. Robert Standaert (Belgium). In addition to the technical meetings the delegates visited works of British superphosphate manufacturers. The president of the ISMA this year is Mr. Douglas J. Bird; the secretary is Dr. G. F. New.

Change of Address

Anglo-Dal Limited have moved from Imperial House, 84/86 Regent Street, to New Oxford House, Bloomsbury Way, London, W.C.1 (Tel.: HOLborn 4366—10 lines).

Recent Advances in Distillation

[continued from opposite page

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R. A. Lovett Joins Board

Freeport Sulphur Expansion

EARLY this week it was announced that Mr. Robert A. Lovett, former US Secretary of Defence, has been elected a member of the board of directors of Freeport Sulphur Company, which is a large supplier of sulphur to the United Kingdom and one of the largest sulphur producers in the world.

The announcement of Mr. Lovett's election was made by John Hay Whitney, board chairman, who himself was recently appointed by President Eisenhower to serve on the US Commission on Foreign Economic Policy.

Mr. Lovett resigned from the American Government early in 1953 to re-enter private business after having served in a number of high posts. As Assistant Secretary of War for Air from 1941 to 1945, he was primarily responsible for the World War II aircraft programme for which he was awarded the Distinguished Service Medal. He later served as Under Secretary of State under General Marshall and was appointed Secretary of Defence in 1950.

The Freeport company at the same time also reported several recent developments in connection with its efforts to increase the supply of sulphur.

Construction of its large new Garden Island Bay sulphur mine at the mouth of the Mississippi River is nearing completion, the company said. Garden Island Bay, designed to produce 500,000 long tons of sulphur per year, should be in production before the end of the year.

Garden Island Bay will be the second new Freeport mine to go into production. Bay Ste. Elaine, an 'amphibious' operation because of its watery location, was completed late in 1952. The mining plant is barge-based and all drilling is done from floating rigs.

Another new Freeport mine, Nash in Texas, should be ready early in 1954, and a fourth mine, Chacahoula, in 1955, the company said. These projects, plus Bay Ste. Elaine, will provide more than 725,000 tons of annual productive capacity.

A vice-president of Freeport Sulphur, Mr. John C. Carrington, is at present touring Europe, making the acquaintance of business contacts of his company and editors of trade and financial publications.

Engineering Exhibition

THE nineteenth Engineering, Marine & Welding Exhibition and The Chemical Plant Exhibition, which closed on 17 September attracted 50 per cent more visitors than that held two years ago. As a very high proportion of the visitors to the exhibition were either potential purchasers or persons directly connected with the engineering industry this very large increase was most encouraging. Reports from exhibitors indicated that the majority were more than satisfied at the number of serious inquiries received. Many visitors remarked that it was the finest display of engineering equipment which they had ever seen. In particular the Chemical Plant Exhibition, which was for the first time held jointly with the Engineering, Marine & Welding Exhibition was acclaimed a great success.

Heads of business organisations as far afield as the USA and New Zealand made special journeys to London to visit the exhibitions. It is known that prospective purchasers from at least 60 overseas countries attended the exhibition.

Chemical Works Sports

THE fifth annual sports fete of Kemball, Bishop & Company, Ltd., which took place on Saturday, 12 September, 1953, at the Ashton Playing Fields Woodford Bridge, provided about 1,100 employees, former employees, and their families with an enjoyable afternoon and opportunities for renewing old friendships.

The proceedings were opened by the chairman, Mr. J. E. Whitehall, and a full programme included not only the conventional track and field events, but also a liberal number of novelty items which provided both competitors and spectators with considerable amusement.

Refreshments were provided for all, and the children were treated to a film performance designed especially for their benefit. A fine and warm afternoon added immeasurably to the pleasure of all present.

After the distribution of the prizes by Mrs. E. L. N. Tuck, the wife of one of the directors, she was presented with a bouquet of carnations by Miss J. Leach, one of the most junior members of the assembled company.

Methane from Watergas

Catalytic Enrichment of Industrial Gases

IT has long been recognised that the catalytic synthesis of methane from carbon monoxide and hydrogen in watergas and other industrial gases is a possible process for the enrichment of such gases to the calorific value of town gas. Catalytic enrichment could be applied to watergas or producer gas made from coal or coke by existing processes, or it could form the final stage in a process for producing town gas by the complete gasification of coal and coke.

It is also conceivable that a gas suitable for enrichment could be produced by the underground gasification of coal. Catalytic enrichment is an alternative to the existing practice of making carburetted watergas, and it would have the advantage of producing town gas from wholly indigenous sources.

The Fuel Research Station, Greenwich, has just published a report of research carried out with the object of developing a process suitable for operation on a large scale. The work was begun in 1939, with the co-operation of the gas industry, with the aim of producing gas sufficiently rich in methane to make liquefaction practicable, as attention was then being given to the possibility of using liquid methane as a fuel for road transport. After the war emphasis was transferred to the production of town gas from low-grade fuels.

The synthesis of methane from a gas mixture of the composition $3H_2 + CO$ in the presence of nickel was first studied by Sabatier and Senderens. The predominant reaction is

$$3H_2 + CO \rightleftharpoons CH_4 + H_2O + 49 \text{ k.cals.}$$

However, as was shown by Armstrong and Hilditch, the watergas shift equilibrium

$$H_2O + CO \rightleftharpoons H_2 + CO_2 + 9.8 \text{ k.cals.}$$

is closely approached in the presence of nickel catalysts under the same reaction conditions.

The most important secondary reaction in this system is the catalytic decomposition of carbon monoxide:

$$2CO \rightleftharpoons CO_2 + C + 41.0 \text{ k.cals.}$$

If this is taken into account in the calculation of equilibria it is found that some elementary carbon must be formed unless the ratio of hydrogen to carbon monoxide exceeds a certain value.

Consideration of the existing data showed that satisfactory conversion to methane could be expected at atmospheric pressure and temperatures in the region of 300°, with sufficiently active nickel catalysts. The major problem encountered was the effective dissipation of the heat of reaction, since it was found that excessive formation of carbon occurred if the temperature of the catalyst was allowed to rise above 500°.

Two methods of removing the heat of reaction were tested on an intermediate scale, in plant processing 200 cu. ft. of watergas per hour. In the first method a close-packed bed of catalyst was used, subdivided into narrow cells surrounded with a liquid boiling at a suitable temperature, such as mercury, diphenylamine, diphenyl or tetralin. In the second method the catalyst was contained in a perforated sheet-metal cylinder, while the gas passed along the annular space between this cylinder and a cooled wall, and so had access to the catalyst only through the holes in the cylinder.

Both Methods Satisfactory

Both methods gave satisfactory results on the intermediate scale, the total yield of methane per lb. of catalyst used being 2,000-3,000 lb., but the second method showed greater promise as a basis for the construction of full-scale plant processing 10,000 to 40,000 cu. ft. of gas per hour. It had the advantage of virtually eliminating the formation of carbon when watergas was used, whereas with liquid-jacketed close packed beds carbon was formed on the catalyst if the volume ratio of hydrogen to carbon monoxide was less than 1.5: 1.

Methods of construction have been recommended for full-scale plant to process 20,000 cu. ft. per hour; about 100 reaction tubes of the form used in the intermediate-scale tests would be enclosed in a single cylindrical water jacket 12 ft. high and about 2 ft. in diameter, in which steam would be generated. The purification of the process gas would be carried out by means of alkaline iron oxide at 200°; about 100 cu. ft. of this material would be required. The tem-

perature could be maintained by preheating the process gas by heat exchange with the enriched gas leaving the synthesis unit.

The investigation was concerned only with enrichment of gas at atmospheric pressure. Early experiments showed that the performance of typical catalysts at higher pressures was broadly similar to that at atmospheric pressure, but no advantages were found, and the formation of carbon appeared to be more rapid. It is probable that if methane synthesis under pressure were desirable, plant of the type suggested would function satisfactorily.

Fuel Research Technical Paper No. 57, 'Catalytic Enrichment of the Industrial Gases by the Synthesis of Methane,' published by HMSO for DSIR, price 2s.

£20,000 Export Challenge

A STRIKING demonstration of Britain's ability to deliver the goods was given last week, on the despatch from the works of G. A. Harvey & Co. (London), Ltd., of a flash fractionating column, a complicated steel structure valued at £20,000.

The order was secured from the American controlled Bahrein Refinery in direct competition with US firms. Time was the very essence of the contract and there was some reluctance to place the order in this country, on account of reputed delays in deliveries. Harveys regarded this as a challenge to British industry, and gave a definite undertaking to deliver within the stipulated time.

The column, which has an overall length of 72 ft. and a diameter of 8 ft., weighs 48 tons. It was constructed to API-ASME Code, and was subject to a hydraulic test pressure of 380 lb. per sq. in.

Messrs. Colvilles undertook the production of over 50 tons of steel plates, clad with a special type of high chromium stainless-iron, containing aluminium, type 405 11/13 per cent 'Colclad,' not previously made in this country for cladding. Due to the vast amount of research before the steel was ultimately rolled, the plates could not be made available until 2½ months before the promised delivery date. Special organisation was necessary to effect the completion within contract time, and the facts were put to the teams of workmen responsible. They volunteered to sacrifice holiday arrangements and by working day and night shifts completed the work in less than one-third of the time originally allowed.

Rubber Production Figures

WORLD production of natural rubber during July totalled 152,500 tons. This was an increase of 20,000 on the June total, but 10,000 tons less than the figure for July last year.

Natural rubber consumption during July was the lowest for any month so far this year—117,500 tons, compared with 125,000 tons in June. It was, however, 12,500 tons higher than for July last year.

For the first seven months this year, production has exceeded consumption by 70,000 tons, the respective figures being 977,500 and 907,500. The consumption total includes Russian imports estimated at 40,750 tons and Chinese imports estimated at 33,750 tons.

Stocks at 31 July were at their highest since January—820,000 tons.

World production of synthetic rubber in July was 87,000 tons, which was 500 tons less than the June figure but still well above the total of 65,740 tons for July last year.

Consumption of the synthetic product for July totalled 67,500 tons, a drop of 12,500 tons compared with the June figure but 2,500 tons more than the total for July last year. Stocks at the end of July stood at 177,500 tons, an increase of 40,000 tons since 1 January.

Printing Ink Research

RAPID drying of printing inks, paints and varnishes is promoted by a new technique explained at a meeting of the American Chemical Society in Chicago recently by Dr. Raymond R. Myers, research associate in the Lehigh University department of chemistry. It was, he said, based on the discovery that certain inexpensive compounds of the amine class speed up the drying of linseed oil.

The present principal driers, cobalt and cobalt compounds, are replaced by suitable amines, in conjunction with manganese, iron or certain other metal driers. The amines unite with the metal dryer to form highly complex substances which promote drying much quicker than the metals by themselves.

Co-author of the technique with Dr Myers is Dr. Albert C. Zettlemoyer, associate Professor of Chemistry at Lehigh University and Director of Research of the National Printing Ink Research Institute.

The Chemist's Bookshelf

GENERAL BIOCHEMISTRY. By Joseph S. Fruton and Sofia Simmonds. 1953. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Pp. 940. 80s.

This is a remarkable book; it dares to defy the contention that no satisfactory advanced treatise of general biochemistry can now be written except by multiple authorship. This, one had thought, was the age of the specialised article, the annual review, the monograph and the edited text-book. Professor Fruton and Dr. Simmonds prove us wrong, and in doing so demonstrate very clearly some of the advantages of a comprehensive presentation of the subject by a strictly limited authorship.

First, it permits a textual coherence which is frequently lacking from edited volumes, a coherence which, in this particular case, depends less upon the authors' scheme of ordering their chapters than upon their keen and sustained awareness of the fact that our modern knowledge of metabolic pathways has, of itself, imposed an order upon biochemical data which, even twenty years ago, could not have been descried. Further, the authors have been able to benefit by focusing their attention on important fields of contemporary research without letting their text become congested with all the minutiæ of progress still awaiting absorption into accepted theory; we are allowed to survey the broad avenues along which research is leading us, without stubbing our toes too frequently on the boulders which still litter the ground for the worker in any particular field.

For these reasons this volume is admirably suited to the needs of advanced students, and may be strongly recommended to those workers of Ph.D. standard, whose more defined research projects sometimes leave them little time for general reading.

It would be impertinent to seek minor flaws in a book which has been so abundantly successful in its aims; rather one would prefer to instance some few examples from its pages to convey a measure of its scope and up-to-date treatment: revised views of nucleic acid structure are considered in the light of recent chromatographic evidence; the conception of the basic importance of multi-enzyme systems in cellular metabolism is given prominence, while fields of outstanding contemporary endeavour such as oxidative phosphorylation and fatty acid synthesis are given very adequate treatment from which a student might well derive stimulation to seek further in the original literature. UDPG, coenzyme A, sedoheptulose, vitamin B_{12}—these and many other compounds of an equally esoteric significance make their appearance, and always it should be noted, with an emphasis upon metabolic function rather than structure.

Wider in its range, though less detailed in some of its treatment, to suggest that this book bears comparison with Professor Baldwin's 'Dynamics of Biochemistry' will give an indication of the reviewer's estimate of its worth; it is a fine advanced text-book, and one which, we must hope, will be kept freshly before us in regularly revised form. —F.H.M.

New Italian Yarn Plant

PRODUCTION of acetate yarns and staple fibres is planned to be started soon at a new plant at Magenta, near Milan, which is reported to have an eventual capacity of 4.4 mil. lb. a year.

The plant will be operated by a new company, the 'Filaceta,' with capital of Lire 1,000,000—about £578,000—which has been subscribed in equal parts by the Italian concern, Snia Viscosa, and Courtaulds Limited, so that it is a joint Anglo-Italian venture.

Capital equipment is the most recent British type and has been specially imported from the UK. Courtaulds Limited are stated to be providing British experts in the production of cellulose acetate fibres to work in the factory.

HOME

Wolfram and Scheelite Cheaper

With effect from 16 September, the selling price of wolfram to domestic consumers has been reduced from 327s. 6d. to 310s. per unit. The price of scheelite has also been reduced—from 312s. 6d. to 300s. per unit.

Tanker Fire

Five fire engines were required recently to deal with a blazing 15-ton motor tanker containing carbon disulphide. The tanker belonged to Courtaulds, rayon manufacturers, and it caught fire at the firm's Trafford Park works, where it was parked.

'Bisoflex 81' Reduced

British Industrial Solvents have announced that with effect from Monday, 21 September, 1953, the price of 'Bisoflex 81' (their water-white grade of dioctyl phthalate) has been further reduced by 1d. per lb. The new price for 10-ton lots, carriage paid in returnable packages, is 2s. 8d. per lb.

Tinplate Mills Reopening

Nine old-type tinplate mills at two works in Pontardawe and Gorseinon, South Wales, which were closed four months ago because sufficient tinplate to meet demands was being produced by modern mills elsewhere, are to be reopened on 2 November. Contracts for rolling mill equipment—worth £4 000,000—for modernising the Welsh sheet and tinplate industry, have been placed by Richard Thomas and Baldwins Ltd., and the Steel Company of Wales Ltd., with Davy and United Engineering Co. Ltd., Sheffield.

British Polythene for North America

It has been announced that the Plastics Division of Imperial Chemical Industries Ltd. has exported to the USA 2,000,000 lb. of polythene specially suitable for the manufacture of tubing. This is the first large American order for polythene secured by I.C.I. and it comes at a time of a world shortage of this thermoplastic material. In the USA polythene tubing is finding an extensive use for water services and extruders are unable to satisfy the demand from domestic supplies. A similar state of affairs exists in Canada which is now buying I.C.I. polythene for tubing.

Molybdenum Restrictions Go

Restrictions on the use of molybdenum in alloy steel, imposed in June, 1952, have been removed, according to a Ministry of Supply announcement. Supplies have improved. Restrictions on the use of nickel continues.

Change of Address

The offices of George Lewi & Partners, industrial consultants, have been removed to Hanover Court, Hanover Square, London, W.1. The telephone number remains GROsvenor 3772-3; the telegraphic address is Lewichem, Wesdo.

Reduced Further

We have been advised by A. Boake, Roberts & Co., Ltd., that with effect from Monday, 21 September, 1953, the price of di-ethyl hexyl phthalate to BS. 1995 has been further reduced by 1d. per lb. This will mean, for example, that the new 10-ton price rate will be 2s. 8d. per lb.

Blasting Method Described

Mr. R. F. McCormick and Mr. J. Hancock, of the Nobel Division, Imperial Chemical Industries Ltd., presented a paper at a meeting of the Mining Institute of Scotland, at the Royal Technical Institute, Glasgow, last week, describing the application of 'milli-second delay blasting' to mining.

Industrial Cleaning

Mr. G. F. Hicks, who while here established a new company under the name of the Magnus Chemical Company Ltd., of which he is a director, having completed his assignment from the parent company in Australia, returned by air to Melbourne last week. He attended the first international conference on industrial cleaning held recently in Paris under the chairmanship of Mr. W. M. Campbell, president of Magnus Chemical Co. Inc. of the USA, when it was stated that manufacturing arrangements for Magnus cleaning products, with efficient after-sales service, are operating in some 14 countries and sales and service representation has also been set up in nearly 20 others.

· PERSONAL ·

DR. H. HEPWORTH, managing director of I.C.I. (Pharmaceuticals), Ltd., since 1947, and a member of the delegate board from its formation in 1942, retires at the end of September. Dr. Hepworth commenced at the Ardeer, Ayrshire, factory of Nobels Explosives Co., which was later merged in I.C.I., Ltd. He became a delegate director of British Dyestuffs Corporation at Manchester in 1934, and since 1936 has been associated with I.C.I.'s pharmaceutical project. He has travelled extensively in the Near and Middle East, the United States and Canada.

MR. JOHN H. LAWRENCE, the managing director of Jenolite Ltd., specialists in chemical pre-treatment and metal finishing, has left this country for a business tour of South and East Africa. The trip, which aims at opening up new markets and developing those already established in the two territories, will include points of call at Nairobi (Kenya Colony), Durban, East London, Jenolite's South African factory at Johannesburg, and their sales office at Cape Town.

The appointment of MR. ALEXANDER C. ROBERTS as assistant secretary of Monsanto Canada, Ltd., was announced recently. A lawyer and graduate of London University, Mr. Roberts resided in India from 1935 to 1951, where he was employed with the legal firm of Sandersons and Morgans until 1940, and from then until 1951 as assistant secretary with Imperial Chemical Industries (India), Ltd. He returned to England in 1952 and joined Fisons Ltd., where he remained until 1953 when he went to Canada.

The Lord President of the Council has appointed MR. W. L. HEYWOOD, O.B.E. to be a member of the Advisory Council for Scientific and Industrial Research, from 1 October, 1953. Mr. Heywood, who is 52, is General Secretary of the National Union of Dyers, Bleachers and Textile Workers, and is also Secretary of the National Association of Unions in Textile Trades. MR. E. FLETCHER retires from the Advisory Council on 30 September on completion of his period of membership.

MR. J. ARNOLD FOX has been appointed chairman of Price's (Bromborough), Limited, Bromborough Pool Works, near Birkenhead, and will take up his new duties on 1 October, 1953. This company is an associated company of Unilever Limited.

Joseph Crosfield & Sons, Limited, and William Gossage & Sons, Limited, announce that they have agreed to release Mr. Fox to take up his new appointment and he will be resigning his directorships of these companies, as well as Industrial Soaps, Limited (of which company he is at present chairman) with effect from 30 September, 1953.

Mr. Fox was educated at the Boteler Grammar School and Stonyhurst College. He left school in 1923 and joined Joseph Crosfield & Sons, Limited. He has principally been concerned with the sale of chemicals products of Crosfields in connection with which he has travelled in the United States, Canada, South America and South Africa. He was appointed to the board on 25 September, 1945, and was also made a director of William Gossage & Sons, Ltd. He became chairman of this company in 1950.

PROFESSOR F. A. PANETH, who is relinquishing his post as professor of chemistry at Durham University on his appointment as director of the Max Planck Chemical Institute at Mainz, was a member of the British war-time team of scientists who conducted research in atomic energy. An Austrian, he held academic posts at Hamburg, Berlin and Konigsberg before leaving Germany in 1933 because of Nazism. He and his wife became naturalised British subjects just before the war and they intend retaining their British nationality in Germany. Professor Paneth was made a Fellow of the Royal Society in 1947.

MR. FREDERICK GRANT, M.C., Q.C., who has been appointed independent chairman of the executive committee of the British Iron and Steel Federation, spent seven years with the Tees-side steel firm of Bolckow Vaughan before being called to the Bar in 1925. He took silk in 1943 and is a Bencher of the Inner Temple. He has had a large practice at the Bar.

• OVERSEAS •

Kenya Oil Refinery

A Bill to vest in the Crown 2,000 acres of land on the mainland opposite Mombasa Island for an oil refinery has been published by the Kenya Government. It is understood that a plant costing £75,000,000 is being planned for the cite by the Anglo-Saxon Petroleum Company.

North Borneo Oil Search

A gravity survey in an attempt to ascertain more data on the oil potentialities of the area is to be carried out by a technical party on the Dent Peninsula, on the east coast of North Borneo. The concession for this area, and for the Klias Peninsula in the west, together covering about 1,000 sq. miles, is held by the Shell Group.

Tax Exemption

A Brazilian decree has been signed granting exemption from the payment of import duties for a period of five years to imports of machinery for new cement factories or for the expansion of existing factories. The concerns to benefit by this decree are those which have a minimum capital of Cr$25,000,000 and a capacity to produce a minimum of 30,000 tons annually. Cement consumption in 1952 was 2,400,000 tons and production 1,600,000 tons.

Belgium Invests in Canada

Initial financing of Canadian Petrofina, Ltd., a new public company being established by Belgium's Petrofina interests, has been set at $25,000,000 of issued capital. Provided directly by Petrofina, this will consist of 2,000,000 participating preferred shares of $10 par value, out of an authorised total of 4,000,000 preferred; and 5,000,000 ordinary shares of $1 par value, out of an authorised amount of 10,000,000 shares. Petrofina—Compagnie Financiere Belge des Petroles of Brussels—has been operating in Canada since 1950 through Canadian Fina Oil Co., Ltd., a private company which has now been replaced by Canadian Petrofina Ltd. The former concern was the first European company to obtain a stake in oil operations in Western Canada, and now holds interests in producing wells in several areas as well as in 500,000 acres of potential oil lands.

Venezuelan Paint

It is announced that three important paint manufacturers, two from the USA and one from the United Kingdom, will shortly set up paint and varnish factories in Venezuela with their own and Venezuelan capital.

Swedish Alcohol Production

Total 1952 Swedish alcohol production of 154,000,000 litres of 50 per cent potency was made up of 19,100,000 litres of potato spirit and the remainder of sulphite spirit. Corresponding figures for 1951 were 17,900,000 litres of potato spirit and 150,900,000 litres of sulphite spirit, according to *The Anglo-Swedish Review*.

Argentine Petroleum Products

A decree has been issued authorising the Sociedad Anonima Comercial e Industrial Parafina del Plata to manufacture in Argentina paraffin, petroleum jelly and other petroleum by-products. It is stated that this will enable the country to make economies in imports valued at over US $8,000,000 a year.

West German Coal

West German coal production in 1953 is expected to amount to 125,000,000 tons, compared with 123,300,000 tons in 1952. Imports of American coal, if continued at the rate of January-March, 1953, are likely to total 5,000,000 tons in 1953, almost 1,000,000 tons less than in 1952.

Duperial Break-up

The final segregation of holdings in 'Duperial'—the joint I.C.I.-Due Pont company in Brazil and Argentina, whose separation was ordered last year in a big anti-trust suit in New York—is expected to be complete in a week or two. This is more than seven months in advance of the time limit imposed, but the assignment of certain export holdings is expected to take up to another six months. Although the final court order stipulated that the two companies must compete 'coldly and aggressively,' negotiation for some non-exclusive licences will be allowed for nine so-called 'fringe' British patents for PTFE; one British patent on metallochrome finishes; two South African specifications for PTFE, and two British applications; and four Canadian patents relating to spinning.

Publications & Announcements

PREPARED chiefly to cover the syllabus of the Purchasing Officers Association final examination subject, 'Raw Materials (Economic and Geographical Survey),' a series of 18 booklets has been completed by the publication of 'Natural and Synthetic Fibres.' It is recognised that a work of much greater magnitude than this 40 page booklet would be needed to cover the variety of fibres known to and employed by industry as a whole. For that reason it has been decided to review in the booklet only seven widely-used fibres—esparto, flax, jute, sisal and manila, glass, nylon and rayon. These have been dealt with as to origin or geographical location; method of production; volume of output; and employment and end usage. Sufficient has been included not only for the initial education of the student, but to provide in briefest form up-to-date information for the general user. Copies of the booklet (3s. 6d.) are obtainable from the Association at Wardrobe Court, 146a Queen Victoria Street, London, E.C.4.

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FROM H. K. Lewis & Company, Ltd., 136 Gower Street, London, W.C.1, we have just received a copy of their latest Catalogue of Books on Chemistry, conveniently sectionalised under the headings of General, Inorganic, Physical, Organic and Analytical Chemistry. In turn, each section is appropriately sub-divided, which makes the search for specific books all the easier. American publications are marked with an asterisk and it is pointed out that in present conditions delay in supplying these is inevitable. Bi-monthly lists of new publications are issued and sent gratis on application.

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JUST published by British Driver-Harris Company, Ltd., and available from their Gaythorn Mill headquarters in Manchester, is their new 'Standard List and Trade Prices' of 'Drivex' cables. All 'Drivex' cables conform to the latest British Standards Specifications (1953), and the eight ranges of cables detailed in the present list are appropriately referenced. This 16 p. book, clearly printed and bound pocket-size in stiff card, gives comparative sizes, nominal areas and prices in easy-to-read tabular form.

RESISTANCE to chemical attack, electrical resistance, light transmission and good appearance combined with satisfactory mechanical strength are nowadays regarded as essential properties in an increasing range of materials and for that reason there is a growing tendency for plastics to be the engineer's initial choice. Indeed, plastics have become established as sound engineering materials and some of the credit for this is legitimately claimed by the Witton Moulded Insulation Works of the General Electric Company Ltd. This works has behind it nearly 40 years of moulding experience and has acquired an immense fund of knowledge in the plastics field. Some indication of the extent of the facilities available is given by means of clear text and numerous admirable illustrations in a booklet just published by the company under the title 'Moulded Plastics for Industry,' copies of which are obtainable from the G.E.C. at Magnet House, Kingsway, London, W.C.2.

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THE ease of hydrolysis of ethyl silicate, which enables bonded refractories of excellent green and fired strength to be made, has led to its use in a number of other important applications. The chief of these are; permanent ceramic moulds for repetition casting; precision piece moulds, a modification of the lost wax method in which the use of an expendable wax pattern is eliminated; high frequency furnace linings; and cast refractories of intricate and detailed shape. A 24-page, admirably illustrated brochure just issued by Monsanto Chemicals Limited, Victoria Station House, Victoria Street, London, S.W.1, points out that Silester O (Monsanto's ethyl silicate containing 40 per cent silica) is used for all the purposes mentioned. As an alternative, Silester A — an amine modified form of Silester O—is available for certain specialised purposes where speed of gelation and simplicity of use are the prime considerations.

Atmospheric Pollution Control

Stretford is pressing for the appointment of an additional alkali inspector to control atmospheric pollution around Trafford Park.

Chemical & Allied Stocks & Shares

THE reduction in the bank rate from 4 per cent to 3½ per cent, which came as a surprise to the City, was followed by a rise of values on the Stock Exchange under the lead of British Funds. Lower money rates imply lower yields and higher prices for gilt-edged stocks and all classes of fixed-interest securities quoted on the Stock Exchange. Best levels have not been fully held at the time of writing, but gains were substantial on balance and gilt-edged stocks are now at their highest since 1951. Leading industrial shares have also taken their cue from the rise in gilt-edged. Sentiment was helped by the view that the lower bank rate will reduce the cost of financing new plant and equipment and give a fillip to export trade. In some quarters it is being suggested that a further cut in the bank rate to 3 per cent may be in prospect.

As was to be expected, shares of chemical and allied companies reflected the upward trend in markets. Imperial Chemical have risen strongly to 46s. 10½d. at the time of writing in front of the interim dividend which will be announced by the time these notes are in print. A month ago, the price was 44s. 4½d. Nevertheless, in many directions share prices are lower on balance for the month, although they have improved since the bank rate reduction. Earlier, markets had been affected by the reaction on Wall Street, and sentiment is still affected to some extent by fear that the downward trend at that centre may continue. Fisons, which were 39s. a month ago, are 37s. 9d. at the time of writing, but the market is continuing to assume that the dividend total will be increased. British Chrome Chemicals 5s. shares at 15s. 9d. attracted on the dividend, while elsewhere, Laporte 5s. units have strengthened to 11s. 10½d. and Monsanto 5s. units were 22s. 1½d., compared with 21s. 10½d. a month ago. In other directions, Reichhold Chemical 5s. shares have moved up from 6s. to 7s., Yorkshire Dyeware & Chemical 5s. shares were 7s. 9d., against 6s. 9d., and Coalite & Chemical 2s. units were again around 2s. 1½d. Albright & Wilson 5s. units strengthened from 16s. 6d. to 17s. Preference shares also participated in the rise, all types of fixed-interest securities having moved higher in price following the bank rate reduction. Imperial Chemical 7 per cent preference, for instance, are now 29s., which compares with 27s. 9d. a month ago.

Elsewhere, Boake Roberts 5s. units were 8s. 9d., William Blythe 3s. shares 5s. 9d., while Hardman & Holden 5s. shares were 8s. 9d. 'ex' the share bonus, and Borax Consolidated at 35s. 4½d. were slightly higher on balance. British Glues 4s. units have strengthened to 9s. 9d. and there was a better trend in plastics shares with Kleemann 1s. shares at 8s. 6d., British Industrial Plastics 2s. shares 4s. 7½d. Bakelite 10s. shares 19s. 9d. and British Xylonite £1 units 27s. 6d. In other directions, Boots Drug 5s. units were 21s. 6d., United Molasses 10s. units 30s. 3d. and the 4s. units of the Distillers Co. strengthened to 17s. 3d. Turner & Newall were 56s. 6d. and elsewhere, Glaxo 10s. units were 42s., awaiting the dividend announcement. Staveley were 70s. 6d., and Powell Duffryn 26s. 3d.xd. Unilever were active around 49s. 3d. Triplex Glass 10s. units strengthened to 23s. after publication of the full report and accounts. Oils were active, but have not kept prices. Shell were 88s. 9d. Anglo-Iranian were active around 145s. 7½d. on talk of a possible increase in the forthcoming interim dividend.

Balance Prices Reduced

IN a revised price list of their latest models, Messrs. L. Oertling, Ltd., announce important price cuts to become effective on 30 September.

These reductions affect the Aperiodic and 'Releas-o-matic' chemical balances embodying the latest technical developments to secure rapid and accurate weighing even by junior assistants with resultant economies where large numbers of routine weighings have to be carried out.

It is understood that the new prices will apply to all balances delivered on or after 30 September, even though placed at the higher prices previously current. Such substantial reductions, now made possible by the greatly increased productivity of Oertling's new and up-to-date factory at St. Mary Cray, should contribute substantially to Britain's competitive position in the supply of high grade balances for export.

British Chemical Prices

LONDON.—There have been no outstanding changes in prices or market conditions during the week, and the movement to the chief home consuming industries has continued to follow a steady course with good quantities being called for against contracts. A more active trend is reported in export trade and a number of bookings for shipment have been secured despite the competitive conditions in overseas markets. Buying interest in the coal tar products market is mainly centred on the creosote oil and tar acids, while rather more inquiry has been reported for cresylic acid.

MANCHESTER.—Apart from an easing of prices for litharge and the red and white leads, there has been little change of any consequence in quotations on the Manchester chemical market during the past week. Textile and most other industrial chemicals are meeting with a steady demand on home-consumption account and there is a fairly steady movement to the overseas outlets. A fair number of additional inquiries have been dealt with during the past few days. In the fertiliser section, basic slag and agricultural lime are being taken up in relatively good quantities and rather more buying interest has been shown in sulphate of ammonia and superphosphates.

GLASGOW.—During the past week business has steadily improved and the demand for the usual run of general chemicals has been very satisfactory.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 1 ton, £88. 80% pure, 10 tons, £92 ; commercial glacial 10 tons, £94 ; delivered buyers' premises in returnable barrels ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £138 per ton.

Acetone.—Small lots : 5 gal. drums, £143 per ton ; 10 gal. drums, £125 per ton. In 40/50 gal. drums less than 1 ton, £105 per ton ; 1 to 9 tons, £105 per ton ; 10 to 49 tons, to £103 per ton ; 50 tons and over, £102 per ton.

Alcohol BSS, Butyl.—£161 per ton in 10-ton lots.

Alcohol, Diacetone.—Small lots : 5 gal. drums £162 per ton ; 10 gal. drums, £172 per ton. In 40/45 gal. drums ; less than 1 ton, £142 per ton ; 1 to 9 tons, £141 per ton ; 10 to 50 tons, £140 per ton ; 50 to 100 tons, £139 per ton ; 100 tons and over, £138 per ton.

Alcohol, Ethyl.—300,000 gal. lots, d/d., 2s. 11d. per proof gallon ; 100,000 and less than 200,000 gal. lots, d/d, 3s. per proof gallon.

Allyl Alcohol.—Less than 40 gals., 3s. 10½d. per lb. ; 40 gal., 3s. 6½d. per lb. ; 2 to 5 40 gal. drums, 3s. 4½d. per lb. ; 1 ton and over, 3s. 2½d. per lb.

Alum.—Ground, about £23 per ton, f.o.r. MANCHESTER : Ground, £25.

Aluminium Sulphate.—Ex works, £14 15s. per ton d/d. MANCHESTER : £14 10s. to £15.

Ammonia. Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums ; 1 ton lots £58 per ton.

Ammonium Chloride. — Grey galvanising, £31 5s. per ton, in casks, ex wharf. Fine white 98%, £25 to £27 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate. — MANCHESTER : £6 5s. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £93 and £91 10s. per ton.

Antimony Sulphide.—Golden, d/d in 5-cwt. lots as to grade, etc., 2s. 2d. to 2s. 8d. per lb. Crimson, 3s. 4½d. to 4s. 5½d. per lb.

Arsenic.—Per ton, £59 5s. nominal, ex store.

Barium Carbonate.—Precip., d/d ; 2-ton lots, £35 5s. per ton, bag packing.

Barium Chloride.—£42 5s. per ton in 2-ton lots.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £38 per ton d/d ; 2-ton lots, £38 5s. per ton d/d.

Bleaching Powder.—£21 per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140-lb. bags, carriage paid: Anhydrous, £59 10s.; in 1-cwt. bags; commercial, granular, £39 10s.; crystal, £42; powder, £43; extra fine powder, £44; B.P., granular, £48 10s.; crystal, £51; powder, £52; extra fine powder £53.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £68; crystal, £76; powder, £73 10s.; extra fine powder, £75 10s.; B.P., granular, £81; crystal, £88; powder, £85 10s.; extra fine powder, £87 10s.

Butyl Acetate BSS.—£173 per ton, in 20-ton lots.

***sec.* - Butyl Alcohol.**—5 gal. drums £159; 40 gal. drums: less than 1 ton £124 per ton; 1 to 10 tons £123 per ton; 10 tons and over £122 per ton; 100 tons and over £120 per ton.

***tert.* - Butyl Alcohol.**—5 gal. drums £195 10s. per ton; 40/45 gal. drums: less than 1 ton £175 10s. per ton; 1 to 5 tons £174 10s. per ton; 5 to 10 tons, £173 10s.; 10 tons and over £172 10s.

Calcium Chloride.—70/72% solid £12 10s. per ton.

Chlorine, Liquid.—£32 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chromic Acid.—2s. 0½d. to 2s. 0¾d. per lb., less 2½%, d/d U.K.

Citric Acid.—1-cwt. lots, 205s. cwt.; 5-cwt. lots, 200s. cwt.

Cobalt Oxide.—Black, delivered, 13s. per lb.

Copper Carbonate.—MANCHESTER: 2s. 4d. per lb.

Copper Sulphate.—£74 per ton f.o.b., less 2% in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £10 2s.

Ethyl Acetate,—20 tons and upwards, d/d, £151 per ton.

Formaldehyde.—£37 5s. per ton in casks, d/d.

Formic Acid.—85%, £82 10s. in 4-ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1.260 S.G., £14 7s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hydrochloric Acid.—Spot, about 12s. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—27.5% wt. £124 10s. per ton. 35% wt. £153 per ton d/d. Carboys extra and returnable.

Iodine.—Resublimed B.P., 16s. 4d. per lb. in 28 lb. lots.

Iodoform.—25s. 10d. per lb. in 28 lb. lots.

Lactic Acid.—Pale tech., 44 per cent by weight £122 per ton; dark tech., 44 per cent by weight £74 per ton ex works 1-ton lots; dark chemical quality 44 per cent by weight £102 per ton, ex works; usual container terms.

Lead Acetate.—White: About £136 10s. per ton.

Lead Nitrate.—About £116 per ton.

Lead, Red.—Basis prices per ton. Genuine dry red lead, £123; orange lead, £135. Ground in oil: red, £149 10s.; orange, £161 10s.

Lead, White.—Basis prices: Dry English, in 5-cwt. casks £141 per ton. Ground in oil: English, under 2 tons, £162.

Lime Acetate.—Brown, ton lots, d/d, £40 per ton; grey, 80-82%, ton lots, d/d, £45 per ton.

Litharge.—£123 per ton, in 5-ton lots.

Magnesite.—Calcined, in bags, ex works, £22 to £24.

Magnesium Carbonate.—Light, commercial, d/d, 2-ton lots, £84 10s. per ton, under 2 tons, £92 per ton.

Magnesium Chloride.—Solid (ex wharf), £16 per ton.

Magnesium Oxide.—Light, commercial, d/d, under 1-ton lots, £245 per ton.

Magnesium Sulphate.—£15 to £16 per ton.

Mercuric Chloride.—18s. 3d. per lb. in 28-lb. lots; smaller quantities dearer.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £30 per ton.

Methylated Spirit.—Industrial 66° O.P. 10 gals., 5s. 4½d. per gal.; pyridinised 64 O.P. 100 gal., 5s. 6½d. per gal.

Methyl Ethyl Ketone.—10-ton lots, £141 per ton del.

Methy *iso*Butyl Ketone.—10 tons and over £162 per ton.

Nickel Sulphate.—D/d, buyers U.K. £154 per ton. Nominal.

Nitric Acid.—£35 to £40 per ton, ex-works.

Oxalic Acid.—Home manufacture, in 5-cwt. casks, £139 per ton, carriage paid.

Phosphoric Acid.—Technical (S.G. 1.700) ton lots, carriage paid, £87 per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 3½d. per lb.

Potash, Caustic.—Solid, £94 10s. per ton for 1-ton lots ; Liquid, £37 15s.

Potassium Bichromate.—Crystals and granular, 11½d. per lb. ; ground, 1s. ½d. per lb., standard quantities.

Potassium Carbonate. — Calcined, 96/98%, £59 10s. per ton for 1-ton lots, ex-store.

Potassium Chloride.—Industrial, 96%, t-ton lots, £23 to £25 per ton.

Potassium Iodide.—B.P., 14s. 10d. per lb. in 28-lb. lots ; 14s. 4d. in cwt. lots.

Potassium Nitrate.—Small granular crystals, 81s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 9½d. per lb. for 1-cwt. lots ; for 3 cwt. and upwards, 1s. 8½d. per lb. ; technical, £8 11s. 6d. per cwt. ; for 5 cwt. lots.

***iso*Propyl Alcohol.**—Small lots : 5 gal. drums, £118 per ton ; 10-gal. drums, £108 per ton ; in 40-45 gal. drums ; less than 1 ton, £83 per ton ; 1 to 9 tons £81 per ton ; 10 to 50 tons, £80 10s. per ton ; 50 tons and over, £80 per ton.

Salammoniac.—Dog-tooth crystals, £70 per ton ; medium, £67 10s. per ton ; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid. — MANCHESTER : Technical 2s. 7d. per lb. d/d.

Soda Ash.—58% ex-depot or d/d, London station, about £14 3s. per ton.

Soda, Caustic.—Solid 76/77% ; spot, £25 to £27 per ton d/d. (4 ton lots).

Sodium Acetate.—£70 to £75 per ton d/d.

Sodium Bicarbonate.—Refined, spot, £13 10s. to £15 10s. per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 9¾d. per lb. ; anhydrous, 11¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite.—Powder, 60/62%, £40 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£75 15s. to £82 per ton.

Sodium Cyanide.—100% basis, 9¾d. to 10¾d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals £28 a ton ; commercial, 1-ton lots, £26 per ton carriage paid.

Sodium Iodide.—B.P., 16s. 4d. per lb. in 28-lb. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £123 ton.

Sodium Metasilicate.—£22 15s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, over 98% 6-ton lots, d/d station, £27 10s. per ton.

Sodium Nitrite.—£31 per ton (4-ton lots).

Sodium Percarbonate.—12½% available oxygen, £8 2s. 10½d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots : Di-sodium, crystalline, £37 10s., anhydrous, £78 10s. ; tri-sodium, crystalline, £39 10s., anhydrous, £75 10s.

Sodium Prussiate.—1s. to 1s. 1d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber's Salt).—£10 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £7 per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot, £31 per ton, d/d, in drums ; broken, £32 per ton, d/d, in drums.

Sodium Sulphite.—Anhydrous, £59 per ton ; pea crystals, £37 12s. 6d. per ton d/d station in kegs ; commercial, £23 7s. 6d. per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £22 16s. 6d. to £25 6s. according to fineness.

Tartaric Acid.—Per cwt. : 10 cwt. or more, £10 10s.

Titanium Oxide.—Standard grade comm., with rutile structure £143 per ton ; standard grade comm., £130 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d : white seal, £89 10s. ; green seal, £88 10s. ; red seal, £87.

Rubber Chemicals

Antimony Sulphide.—Golden, 2s. 3½d. to 3s. 1½d. per lb. Crimson, 3s. 4½d. to 4s. 5½d. per lb.

Carbon Bisulphide.—£60 to £65 per ton, according to quality.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—Ton lots, £74 10s. per ton.

India-rubber Substitutes.—White, 1s. 6½d. to 1s. 10½d. per lb. ; dark, 1s. 4½d. to 1s. 8½d. per lb.

Lithopone.—30%, £50 per ton.

Mineral Black.—£7 10s. to £10 per ton.

Sulphur Chloride.—British, £55 per ton.

Vegetable Lamp Black.—£64 8s. per ton in 2-ton lots.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £16 2s. 6d.

Compound Fertilisers.—Per ton in 6 ton lots, d/d farmer's nearest station, I.C.I. Special No. 1 £27 9s.

'Nitro-Chalk.'—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean agricultural for 6-ton lots, d/d nearest station, July to September, £26 5s. per ton ; October to November, £26 7s. 6d. per ton.

Coal-Tar Products

Benzole.—Per gal., minimum of 200 gals., ex-works, 90's, 4s. 10¾d. ; pure, 5s. 2d. ; nitration grade, 3s. 3d.

Carbolic Acid.—Crystals, 1s. 4d. to 1s. 6½d. per lb. Crude, 60's, 8s. MANCHESTER : Crystals, 1s. 4½d. to 1s. 6½d. per lb., d/d crude, 8s. naked, at works.

Creosote.—Home trade, 1s. to 1s. 4d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 1s. to 1s. 8d. per gal.

Cresylic Acid.—Pale 99/99½%, 5s. 8d. per gal. ; 99.5/100%, 5s. 10d. American, duty free, for export, 5s. to 5s. 8d. naked at works.

Naphtha.—Solvent, 90/160°, 4s. 10d. per gal. for 1000-gal. lots ; heavy, 90/190°, 4s. 3½d. per gal. for 1000-gal. lots, d/d. Drums extra : higher prices for smaller lots.

Naphthalene.—Crude, 4-ton lots, in sellers' bags, £14 12s. to £22 per ton, according to m.p. ; hot pressed, £28 per ton in bulk ex-works ; purified crystals, £53 per ton.

Pitch.—Medium, soft, home trade, 160s. per ton f.o.r. suppliers' works ; export trade, 230s. per ton f.o.b. suppliers port.

Pyridine.—90/160°, 32s. 6d. to 35s. per gal. MANCHESTER : 42s. 6d. to 45s. per gal.

Toluol.—Pure, 5s. 7d. ; 90's, 4s. 10d. per gal., d/d. MANCHESTER : Pure, 5s. 3d. per gal. naked.

Xylol.—For 1000-gal. lots, 5s. 8d. to 5s. 10d. per gal., according to grade, d/d.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol 98/100%.—3s. 9d. per lb. d/d.**

***o*-Cresol 30/31° C.—1s. 4d. per lb. d/d.**

***p*-Cresol 34/35° C.—3s. 9d. per lb. d/d.**

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—88/89°C., 1s. 11d. per lb.

Dinitrotoluene.—S.P. 15° C., 1s. 11½d. per lb. ; S.P. 26° C., 1s. 3d. per lb. S.P. 33°C., 1s. 1½d. per lb. ; S.P. 66/68°C., 1s. 9d. per lb.

***p*-Nitraniline.**—4s. 5½d. per lb.

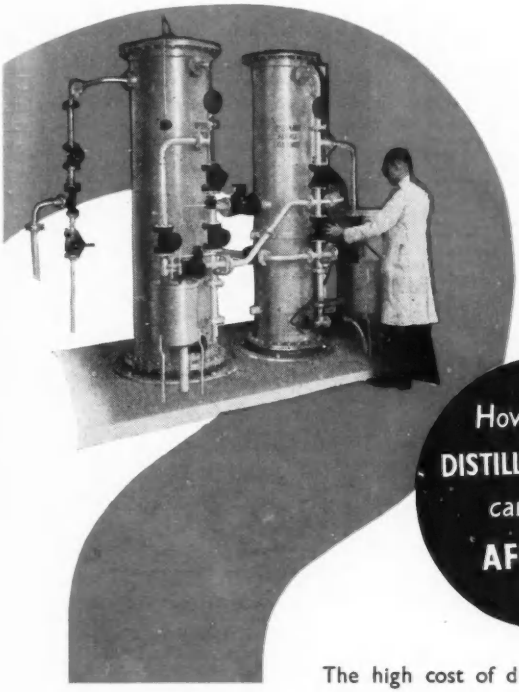
Nitrobenzene.—Spot, 9½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—2s. per lb.

***o*-Toluidine.**—1s. 7d. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—5s. 6d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 5d. per lb., 100%.



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Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

FISONS LTD., Felixstowe, fertiliser manufacturers, etc. (M., 26/9/53.) 18 August, charge supplemental to a trust deed dated 4 September, 1950; charged on Harvest House, Felixstowe, with fixtures, fittings, etc. *£3,500,000. 19 December, 1952.

F. WIDOCKS & CO., LTD., Croydon, manufacturers of cosmetics, etc. (M., 26/9/53.) 18 August, £1,000 debentures; general charge. *£3,000. 21 July, 1953.

Satisfactions

BENGAL IRON CO., LTD., London, E.C. (S., 26/9/53.) 20 August, of trust deed registered 15 March, 1922, and supplemental deeds registered 17 December, 1924, 9 June, 1925, and 5 May, 1933.

BRITANNIA LEAD CO., LTD., London, E.C. (S., 26/9/53.) 20 August, of charges registered 20 January, 1943, and 17 January, 1946.

NORTON ALUMINIUM PRODUCTS, LTD., Cannock. (S., 26/9/53.) 25 August, of debenture registered 10 May, 1952, to the extent of £1,000.

YORKSHIRE PHARMACEUTICAL INDUSTRIES, LTD., Rotherham. (S., 26/9/53.) 19 August, of charge registered 7 September, 1951.

Increases of Capital

The following increases of capital have been announced: LAPORTE CHEMICALS, LTD., from £1,500,000 to £2,000,000; MERCK & CO. (GREAT BRITAIN), LTD., from £100 to £10,000.

Change of Name

The following change of name has been announced: Horta & Ward, Ltd., to Ward, Brooke & Company, Ltd., on 1 September, 1953.

New Registrations

Clayton Dyestuffs Co. Ltd.
Private company. (522,744). Capital £200,000. Manufacturers and dealers in benzole, aniline and all other products of coal and coal-tar, dyestuffs, acids, alkalis and other chemicals, pharmaceutical preparation. Directors: A. E. Peak, T. M. Willcox, Dr. G. Kuhn. Reg. office: 505 Ashton New Road, Manchester, 11.

Walter Apted Ltd.
Private company. (523,166). Capital £12,000. Agricultural merchants, manufacturers of and dealers in artificial manures, manurial products and fertilisers. Permanent directors: W. Apted, Mrs. B. M. Apted, W. M. Apted. Reg. office: Mole Mills, South Molton, Devon.

Calmic Exports Ltd.
Private company. (523,272). Capital £1,000. Chemical manufacturers, chemists, druggists, dry salters. Directors: F. Dunkerley, W. Dunkerley, H. Ward, A. Lloyd, H. T. Mallinson. Reg office: Crewe Hall, Crewe, Ches.

Company News

The Distillers Company
The directors of The Distillers Company, Limited, announce that they have declared a dividend on the preference capital of the company for the six months ending 30 September, 1953, at the rate of three per cent. less income tax, payable on 14 November, 1953, to stockholders on the register at 18 September, 1953.

Newton Chambers & Co. Ltd.
The directors of Newton Chambers and Co. Ltd. will pay an interim dividend on 15 October of 10 per cent on ordinary capital of £653,040 as increased this year by a 6⅔ per cent scrip issue. This compares with an interim payment of 7½ per cent and a final payment of 17½ per cent. for 1952, making a total of 25 per cent on smaller capital.

British Aluminium Co. Ltd.
Stockholders of the British Aluminium Company Ltd. have received a circular in which the directors point out that as there has been little sign of improvement in the difficult trading conditions referred to by

[continued on page 676

A GREAT RANGE -

Leagues beneath the sea, in the rock bound pools and on the sands of the shore are countless varieties of sea shells — each one in this great range being a fine example of a container superbly suited to the particular needs of its contents. We at Reads have also managed to find satisfactory answers to many difficult container problems in the last 84 years (though you never find us peering into pools for inspiration). Thanks to constant developments based upon this long experience, our normal range now includes most types of containers in common use, and new problems are being solved every day. If *you* are planning to introduce new lines, or to re-introduce old ones in more attractive forms, the long experience of Reads of Liverpool is at your service.

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the chairman, Viscount Portal of Hungerford, in his address last May, the maintenance of the interim dividend on the ordinary stock at 4 per cent in respect of the year ending 31 December next should not be taken as an indication that the total distribution for the year will necessarily be the same as in recent years. For each of the two preceding years the total was made up to 12 per cent, less tax, with a final payment of 6 per cent and a bonus of 2 per cent.

Lawes Chemical Co. Ltd.

The directors of Lawes Chemical Co. Ltd. have proposed a scheme whereby all the 200,000 7 per cent non-cumulative 10s. participating preference shares are to be converted into 10s. ordinary shares. As consideration for loss of preferential dividend right, preferential holders will be allotted one new ordinary share for every five preference shares held. The new ordinary shares represent scrip issue shares arising from capitalisation of £7,675 of share premium account. The company, which for 1951-52 increased its equity dividend from 7 to 9 per cent, now announces a payment of 10 per cent for the year ended 30 June last. Group net profit for the year was £48,702, compared with £49,766 for the previous year, after tax of £71,236 (£48,009).

Next Week's Events

MONDAY 28 SEPTEMBER

Institution of the Rubber Industry

Manchester: Engineers' Club, Albert Square, 6.15 p.m. C. Cuthbert: 'The Application of Unsteady State Heat Conduction Theory to Vulcanisation.'

Incorporated Plant Engineers

Leeds: University, 7.30 p.m. Dr. R. H. Evans: 'Recent Developments in Prestressed Concrete.'

TUESDAY 29 SEPTEMBER

Institute of Metal Finishing

London: British Institute of Management, Management House, Hill Street, W.1, 6.30 p.m. Organic Finishing Group. H. Hollis: 'The Development of Modern Organic Finishes.'

THURSDAY 1 OCTOBER

Incorporated Plant Engineers

Peterborough: Dujon Cafe, Market Place. Ladies' Evening.

FRIDAY 2 OCTOBER

Society of Chemical Industry

London: Royal College of Science, S.W.7, 10.30 a.m. to 5 p.m. Agriculture Group, Crop Protection Panel. Two-session symposium on 'Organo-Phosphorous Compounds.' Professor V. B. Wigglesworth, Dr. C. Potter, Dr. J. M. Barnes, Dr. G. S. Hartley, Dr. P. R. Carter, J. R. Nicholls, J. F. Newman.

Manchester: Engineers' Club. Albert Square, 6.30 p.m. E. J. Dunstan: Chairman's address.

Institution of Works Managers

London: Waldorf Hotel, Aldwych, W.C.2, 7 p.m. Annual meeting and film show.

Nottingham: Wellbeck Hotel. 8 p.m. Opening meeting, Notts and Derby branch.

Obituary

Dr. C. G. Fink

The death was reported last week of COLIN GARFIELD FINK, M.A., Ph.D., Sc.D., the famous American electrochemist. Born in 1881, Dr. Fink was educated at Columbia and Leipzig Universities. He was a research engineer with the General Electric Company from 1907-10 and with the Edison Lamp Works from 1910-17. In 1917 he became head of the research laboratory of the Chile Exploration Company of New York and he remained in this post until appointed head of the Division of Electrochemistry at Columbia University in 1922. In 1950, he retired.

Dr. Fink had several books and many papers to his credit but he will always be remembered as the originator of the drawn tungsten filament for electric lamps, aluminium-plate on steel, chromium-plate, and electro-tin-plate. Few electrochemists, or even chemists in general, could claim to have made so many important, practical discoveries as Dr. Fink.

Mr. P. E. Negretti

We regret to announce that MR. PAUL ERNEST NEGRETTI, chairman and managing director of Negretti and Zambra, Ltd., the scientific instrument manufacturers, died suddenly on 20 September at Droitwich, aged 70.

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CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order,* 1952.

A VACANCY arises for a young **CHEMICAL ENGINEER** whose educational standard is equivalent to A.M.I.Chem.E. A person with a little industrial experience would be preferred, but this is not essential. The work will be of an extremely varied nature under qualified chemical engineers and will be invaluable experience to the successful candidate. Reply in confidence to **BOX No. C.A. 3259, THE CHEMICAL AGE, 154, FLEET STREET LONDON, E.C.4.**

CHEMICAL ENGINEERS, capable of leading development teams, required for vital and interesting new process. Reply to **BOX No. C.A. 3258, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**, when application form will be sent.

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS in various Government Departments. The Civil Service Commissioners invite applications for pensionable posts. Applications may be accepted up to December 31st, 1953, but an earlier closing date may be announced either for the competition as a whole or in one or more subjects. Interviews will generally be held shortly after the receipt of the completed application form.

The posts are divided between the following main groups and subjects:—(*a*) Mathematical and Physical Sciences; (*b*) Chemistry and Metallurgy; (*c*) Biological Sciences; (*d*) Engineering subjects; and (*e*) Miscellaneous (including e.g., Geology, Library and Technical Information Services).

AGE LIMITS. For Experimental Officers, at least 26 and under 31 on December 31st, 1953; for Assistant Experimental Officers at least 18 and under 28 on December 31st, 1953. Extension for regular service in H.M. Forces.

Candidates must have at least one of a number of specified qualifications. Examples are Higher School Certificate, General Certificate of Education, Scottish Leaving Certificate, Scottish Universities Preliminary Examination, Northern Ireland Senior Certificate (all in appropriate subjects and at appropriate levels), Higher National Certificate, University degree. Candidates taking their examinations in 1953 may be admitted. Candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. In general a higher standard of qualification will be looked for in the older candidates than in the younger ones.

Inclusive London salary scales:—

Experimental Officer £681-£838 (men); £586-£707 (women).

Assistant Experimental Officer £274-£607 (men); £274-£511 (women).

Starting pay according to age up to 26. At 18, £274; at 26, £495 (men); £467 (women). Somewhat lower in provinces.

Further particulars and application forms from **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S94-95/53. Completed application forms should be returned as soon as possible.

21283/176/EH/a.

SITUATION VACANT

PLANT MANAGER. Large chemical firm requires a plant manager, aged 30-35, at a works in the North-East of England. Good degree in Chemistry or Chemical Engineering together with experience both in research and plant management essential. Should be able to supervise the technical performance of several chemical plants. The post is progressive and pensionable. **BOX NO. C.A. 3263, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

FOR SALE

600

STEAM DRIVEN GENERATING SETS

665-kVA. (500-kW.) Steam driven Alternator Set by **BELLISS & MORCOM SIEMENS,** for 5000/3/50, 77 amps. Steam pressure 150/155 lb. Speed 333 r.p.m.

625-kVA. (500-kW.) Steam Alternator Set by **BROWETT LINDLEY L.D.C.,** for 400/440/3/50, 4 wire, with 230/250 volts line to neutral. Speed 333 r.p.m. Steam pressure 165 lb. sq. in., against 15 lb. back pressure. Makers advise would operate with steam at 180 lb. sq. in. against 20 lb. back pressure.

Two 420/470-kVA. Steam Alternator Sets by **BELLISS &MORCOM MATHER& PLATT,** for 400/440/3/50. Speed 375 r.p.m. Steam pressure 150 lb. sq. in. against 15/20 lb. gauge back pressure.

313-kVA. (250-kW.) Steam Alternator Set by **BROWETT LINDLEY BRITISH WESTINGHOUSE,** for 400/3/50, 4 wire. Steam pressure 100 lb. sq. in., 5 lb. back pressure, or up to 140 lb. sq. in., exhausting to 15 lb.

250-kW. Steam driven **GENERATING SET** by **ASHWORTH & PARKER/MET-VICK.,** for 115 volts D.C. Steam pressure 120 lb. sq. in., exhausting to 26 in. vacuum. Speed 400 r.p.m.

250-kW. Geared Turbo Generator Set by **BELLISS & MORCOM CROMPTON PARKINSON,** for 207/230 volts D.C. Speed 1,000 r.p.m. through reduction gear. Multi stage Turbine designed for steam at 200 lb., 550 deg. F. superheat, plus 25 per cent overload for two hours when running at 6,000 r.p.m.

250-kV Steam driven Alternator Set by **BELLISS & MORCOM HARLAND,** for 400/3/50, 360 amps., 0.8 p.f. Steam pressure 140 lb., 12 lb. back pressure.

240-kW. Turbo Alternator Set by **W. H. ALLEN/L.D.M.,** for 400/3/50. Speed 600 r.p.m. through reduction gear. Steam pressure 150 lb. sq. in., 5 lb. back pressure, or alternatively 200 lb. sq. in., 15 lb. back pressure.

Two 187½-kVA. Steam driven Alternator Sets by **BROWETT LINDLEY BRUCE PEEBLES,** for 400/3/50, 4 wire. Speed 428 r.p.m. Designed for use with steam at 180 lb. exhausting against 7½ lb. back pressure, utilising steam superheated 150 deg.

150-kW. Steam engine driven Alternator Set by **BELLISS & MORCOM HARLAND ENGINEERING,** for 400/3/50, speed 428 r.p.m. Steam pressure 150 lb., 460/500 deg. F. superheat.

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Tel.: Pudsey 2241.

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4—**VESSELS (TILE LINED),** 7 ft. dia. by 14 ft. 6 in.
2—**TANKS, MILD STEEL,** 7 ft. dia. by 5 ft. 9 in.
1—**TANK, MILD STEEL,** 7 ft. dia. by 8 ft. 3 in.
8—**STAINLESS STEEL SEPARATORS,** 4 ft. 4 in. by 20 in.
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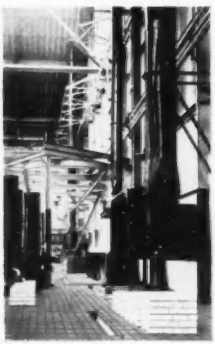

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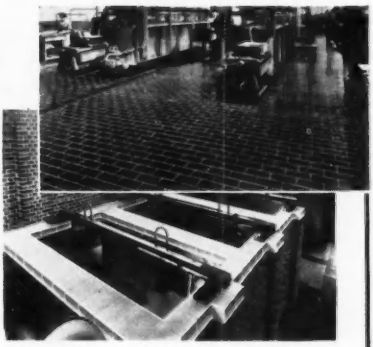

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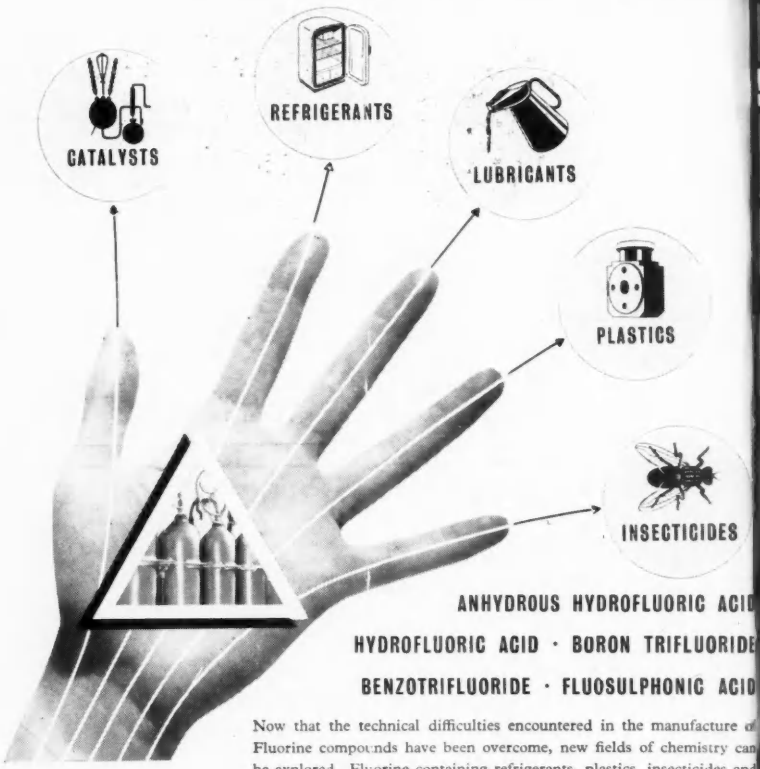

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